Mood Matters in Judgment and Decision Making

Tuning in to Deliberation and Intuition

Marieke de Vries

Colofon

ISBN/EAN: 978-90-9023345-1

Cover illustration: Mieke Janssen
Lay-out: with help of Hannah Nohlen
Photography: Jos de Vries, Marieke de Vries and others
Print: PrintPartners Ipskamp, Nijmegen

Mood Matters in Judgment and Decision Making

Tuning in to Deliberation and Intuition

Een wetenschappelijke proeve
op het gebied van de Sociale Wetenschappen

Proefschrift

ter verkrijging van de graad van doctor
aan de Radboud Universiteit Nijmegen
op gezag van de Rector Magnificus, prof. mr. S. C. J. J. Kortmann
volgens besluit van het College van Decanen
in het openbaar te verdedigen op dinsdag 23 september 2008
om 13.30 uur precies

door

Marieke de Vries
Geboren op 3 maart 1980
te Eindhoven

Promotor

Prof. dr. Cilia L. M. Witteman

Copromotor

Dr. Rob W. Holland

Manuscriptcommissie

Prof. dr. Ap J. Dijksterhuis (Voorzitter)

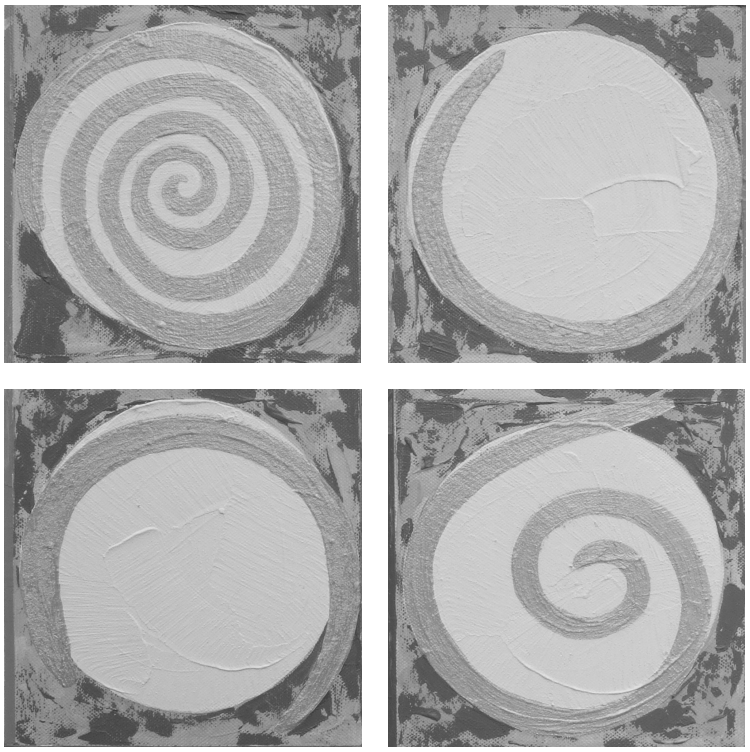
Prof. dr. Marcel Zeelenberg (Universiteit van Tilburg)

Dr. Mike Rinck

Contents

Chapter 1

General Introduction



Our world is full of choices and judgment and decision making is a ubiquitous part of daily life. In our favorite restaurant, we can choose from a long list of dishes and from at least twenty tea flavors. In supermarkets, we can choose from an almost endless amount of breakfast items. We can choose whether or not to go to our friend's party tonight. Television offers more programs than we could ever watch. We think about where to spend our next holiday, and about whether we want red or white curtains in the living room. We also make more essential decisions: Whom to date, which house to buy, which job to apply for. Many of us also make important judgments and decisions, sometimes affecting the lives of others, as professionals: Judges decide about the future of suspects, doctors and psychologists make diagnostic decisions about patients and clients, business professionals make investment decisions, management decisions affect employees, and politicians make decisions affecting society.

Sometimes, we think carefully before making a decision. We thoroughly analyze all the pros and cons before making a decision. Thinking about how to spend the next holiday, at home or in Indonesia, I could deliberate on the pros and cons of the options under consideration. I like sunny weather and exotic food. I also like exploring new places and meeting new people. On the other hand, I do not want to be on an airplane for hours on end and I would love to go to a festival in my home town this summer. And my living room still needs some painting. Based on a careful analysis of these considerations, I may decide to spend my next holiday in my home town or in Indonesia. However, we do not always carefully deliberate. Sometimes, we just go along with a feeling that one choice option (three weeks in Indonesia) is better than another (staying at home). When do we go along with our feelings, and when do we think carefully before making a decision?

Whether we use intuition or deliberation in judgment and decision making depends on multiple factors, such as the availability of cognitive resources, time constraints and beliefs about the validity of the use of intuition or deliberation. In this dissertation, we focus on an ever-present factor in human judgment and decision making: the mood state of the decision maker. In our daily life, our mood states naturally fluctuate as a function of our good and bad experiences and they can have a pervasive influence on the way we think and act. When life is smiling towards us and good things happen to us, we usually feel happy. For example, I feel good when a friend spontaneously invites me for dinner, when the sun is shining, or when a paper gets accepted for publication. Sometimes, we experience difficulties or inconveniences that put us into a bad mood. Cycling to work on a rainy day, missing a train, or receiving bad news can ruin a person's mood

state. When we experience problems or things go wrong, we usually feel bad. How does a person's mood state affect the way this person makes a decision or evaluates a decision outcome?

The goal of the current dissertation is to contribute to our understanding of how an individual's mood state can affect judgment and decision making. In previous research, the influence of mood on intuitive versus deliberative judgment and decision making has been largely unexplored. Whether we use an intuitive or a deliberative decision strategy can have a considerable impact on our judgments and decisions. Our feelings and thoughts do not always point in the same direction. For example, my feelings might seduce me to have a chocolate bar as a snack, whereas upon more careful deliberation, I might decide to eat an apple. Our core idea is that in a happy mood state, decision makers tend to rely on their gut feelings, or intuition, and in a sad mood state, decision makers are more likely to rely on careful deliberation. The current dissertation provides innovative empirical tests of mood impacts on the use of affective intuition versus analytical deliberation in judgment and decision making and aims to further our understanding of reliance on intuition and deliberation as a function of incidental happy versus sad mood states of decision makers.

The current ideas about the role of mood in judgment and decision making stem from a tuning approach (e.g., Clore, Schwarz, & Conway, 1994; Schwarz, 2002). Our mood states might prepare us to act either intuitively or deliberatively. Mood is likely to serve as a conditioned stimulus for the nature of an environment, sometimes correctly signaling its benign or problematic nature and sometimes spilling over from one situation into another. The notion about the tuning function of mood is that an individual's mood state automatically tunes cognition and emotion to meet the processing requirements of the type of situation it signals. In a benign environment, when things go smoothly and there is nothing to worry about, typically there is no need for careful deliberation. In such a situation, individuals can go along with their first affective responses, trust their intuition. However, in an environment that appears to be problematic or threatening and where the exact nature of problems remains unclear, it is important to be more careful and to thoroughly analyze all potentially relevant aspects of the situation.

This dissertation serves two main objectives. First, we aim to show that mood state influences reliance on gut feelings versus analytical reasoning in decision making. In particular, we aim to show that a happy mood state imposes a tendency on decision makers to rely on feelings, or intuition, whereas in a sad mood state decision makers are more likely to rely on logical rules and on a careful analysis of decision options (Chapters 2, 3 and 4). Second, we aim

to gain more insight in the underlying mechanism by which mood state impacts reliance on intuition and deliberation in decision making. We aim to test our ideas about the tuning function of mood, focusing on the fit between mood states and intuitive versus deliberative decision strategies and on the impact of mood on the human tendency to prefer prototypical stimuli over less prototypical ones – an effect presumably reflecting affective reactions to familiarity (Chapters 4 and 5).

In the current chapter I present an overview of the theory and empirical evidence relevant to the discussion of the role of mood in intuitive and deliberative judgment and decision making, starting with a brief overview of psychological perspectives on affect. I discuss various forms of affect and provide a working definition of those forms of affect that are relevant within the framework of the current dissertation: affective states, or mood states, and affective reactions, such as gut feelings. Next, I turn to a prominent distinction in the field of judgment and decision making: intuition versus deliberation. I continue with a discussion of the various roles of affect in judgment and decision making. I will contrast modern views of judgment and decision making, focusing on affective and intuitive aspects, to classical, normative models of judgment and decision making as purely rational and thoughtful. I will then turn to the tuning function of mood in intuitive versus deliberative judgment and decision making. There, I will outline my overall hypothesis concerning the influence of mood states on the reliance on careful deliberation and affective intuition, or sense and sensibility, in judgment and decision making. Finally, I will outline the primary hypotheses of each of the subsequent empirical chapters.

Psychological perspectives on affect

The strange thing about life is that though the nature of it
must have been apparent to everyone for hundreds of years,
no one has left any adequate account of it.
The streets of London have their maps;
but our passions are uncharted.
(Virginia Woolf, *Jacob's Room,* p. 90)

Psychologists have long been interested in the nature of affect and in the way it appears to influence human behavior. In a sense, it initially seems surprising that there are no

straightforward answers to questions about the nature and functions of affect. In the foundations laid to understand affect and in current theorizing about affect from a psychological perspective, different approaches are distinguishable (e.g., Arnold, 1960; Clore & Ortony, 2000; Darwin, 1872; Ekman, 1989; Freud, 1909; 1925; Frijda, 1986; 2007; Gazzaniga, 1972; Gazzaniga & LeDoux, 1978; Harré, 1986; James, 1884; 1890; Lazarus, 1984; LeDoux, 1996; Russell, 2003; Schachter & Singer, 1962; Wundt, 1907; Zajonc, 1980; 1984; see for an overview, e.g., Lewis & Haviland-Jones, 2000; Niedenthal, Krauth-Gruber, & Ric, 2006; Oatley & Jenkins, 1996). While these approaches differ in important ways, they appear to complement rather than contradict each other, focusing on different aspects and functions of affect and often using similar labels for various forms of affect. This vagueness about definitions of affect requires researchers to clarify their usage of the terms.

In the current dissertation, the term affect is used as a general term to denote affective *states*, which I will refer to as moods, as well as affective *reactions,* such as gut feelings. Our characterizations of these various forms of affect are fairly conventional (e.g., Damasio, 1994; Frijda, 1986; 2007; Russel, 2003; Schwarz & Clore, 2007). We use a definition of moods as diffuse affective *states*, or background feelings, which last relatively long. You can be *in* a bad mood state that lasts for minutes, or hours. People do not necessarily know the reason for the mood state they are in. In contrast, affective reactions, or feelings are *about* an object, person, situation, or choice option. This latter category of affect is typically more intense and shorter of duration than mood and includes gut feelings, somatic markers (Damasio, 1994) and bodily signals about choice options or targets of judgments.

In an attempt to understand the role of affect in judgment and decision making, it is important to realize that various forms of affect, such as mood states and affective reactions, can influence judgment and decision making in different ways and might even interact in their impact on judgment and decision making. An intriguing idea, inspired by research on cognitive tuning, is that affective *states*, or mood states, impact the reliance on affective *reactions* in judgment and decision making. We aim to provide the first empirical test for the idea that compared to a sad mood state, in a happy mood state people are more likely to use their affective reactions towards various decision options as a basis for decision making. We focus on mild fluctuations in mood states, as we all experience in our daily lives. Clinical disorders in affect fall beyond the scope of this dissertation. More specifically, we focus on the influence of happy and sad mood states on the reliance on affective reactions versus analytical reasoning in judgment and decision making.

Intuition versus deliberation in judgment and decision making

Below the surface stream, shallow and light,
Of what we say we feel – below the stream,
As light, of what we think we feel – there flows
With noiseless current strong, obscure and deep,
The central stream of what we feel indeed.
(Matthew Arnold, *St Paul and Protestantism,* 1870/2007)

When people make a decision, one thing they can do is rely on their "gut feelings" or intuition. Recently, many scholars from fields ranging from social, cognitive and neuropsychology to business and management have stressed their belief in the importance of intuition in judgment and decision making (e.g., Böhm & Brun, 2008; Damasio, 1994; De Vries, Holland, Witteman, Vente, & Dijksterhuis, 2008; Dijksterhuis, 2007; Gigerenzer, 2007; Hogarth, 2001; LeDoux, 1996; Lieberman, 2000; Klein, 2003; Myers, 2002; Plessner, Betsch, & Betsch, 2008; Sadler-Smith, 2008; Wilson, 2002). As one of them voices it, "It's impossible for us to function effectively without using 'gut feeling'. Intuition presents itself uninvited to us rapidly, and in many different guises, and under the right circumstances its effects can be life-changing and life-saving" (Sadler-Smith, 2008, p.1).

The powers and perils of intuition

Obviously, intuition has its powers and its perils (Myers, 2002). On the one hand, it tends to overlook details, may miss important facts, and tends to ignore instruction. On the other hand, intuition often enables us to escape the bounds of conventional thinking, to see problems in new and novel ways, and to come up with "out of the box" solutions (e.g., Sadler-Smith, 2008). Intuition is usually fast and apparently effortless (e.g., Plessner & Czenna, 2008). Moreover, it can deal with vast amounts of information (e.g., Betsch, Plessner, Schwieren, & Gütig, 2001; Dijksterhuis, 2004; 2007). Intuition is typically experienced as a conscious gut feeling. Its origins, however, mostly stay outside of consciousness (e.g., Sadler-Smith, 2008). Whereas Freud's view of the unconscious was that of a primitive part of mind, full of hidden and suppressed desires and forces (e.g., Freud, 1925), the modern psychological view of the unconscious is different. In contemporary psychology, researchers have provided evidence for the unconscious as a rather smart and highly efficient information processor (e.g., Bargh, 1997;

Dijksterhuis, 2007; Hassin, Uleman, & Bargh, 2005; Wilson, 2002). If used under the right circumstances and well-informed by prior experience, learning and feedback, intuition might be a powerful tool for everyday as well as professional decision makers (e.g., Dijksterhuis & Nordgren, 2006; Sadler-Smith, 2008).

Intuition comes in many forms, such as creative, affective, social, moral, and experiential intuition (e.g., Dijksterhuis, 2007; Epstein, 1994; Gigerenzer, 2007; Gladwell, 2005; Haidt, 2001; Sadler-Smith, 2008). Scientific definitions of intuition vary, with different disciplines highlighting different aspects. In our studies, we focused on *affective* intuition, on "gut feelings". Our notion of intuition in judgment and decision making is of a feeling that something is right or wrong, or that one option is better than another, without being able to explain why. Individuals differ in the extent to which they experience and rely on intuition (e.g., Betsch, 2008; Epstein, Pacini, Denes-Raj, & Heier, 1996). However, contrary to popular belief about female intuition, empirical research generally fails to observe any significant differences between men and women in intuition (e.g., Epstein et al., 1996; Gigerenzer, 2007).

In two minds

A common conception in dual-processing, or dual-system, models in contemporary psychology (e.g., Chaiken & Trope, 1999; Kahneman, 2003; Kuhl, 2000; Sloman, 1996; Strack & Deutsch, 2004; see also Hamm, 1988) is that people process information in two different, complementary ways. The first way of processing, also referred to as System 1 processing (e.g., Sloman, 1996), is generally characterized as relatively fast and unconscious, parallel, automatic, associative and affect-laden. The second way of processing, also referred to as deliberative, rational processing, or System 2 processing, is generally characterized as slow, analytical, conscious, serial, rule-based, and relatively affect-free. Deliberation notices details, likes established methods, facts and data, and tends to follow instruction.

Dual-processing models have also been adopted in the field of judgment and decision making (e.g., Evans, 2008; Kahneman, 2003). Decision makers can use deliberation, or System 2, and rely on a careful, explicit analysis of the information relevant to the decision task at hand. They can also rely on System 1, which is used to denote nondeliberative forms of judgment and decision making as diverse as reliance on intuition, or gut feelings, heuristics, scripts, and general knowledge structures. System 1 judgments and decisions are associated with biases and errors, but they often "satisfice" our needs; they help us to make judgments and decisions that are good enough, without requiring too much of our time and energy (e.g., Kahneman, 2003; Simon, 1955;

1957; 1983; Tversky & Kahneman, 1974). Moreover, under the right circumstances intuitions outperform deliberation (e.g., Damasio, 1994; Dijksterhuis & Nordgren, 2006; Gigerenzer, 2007; 2008; Plessner & Czenna, 2008; Wilson, 2002).

In the current dissertation, we do not aim to find out whether intuition or deliberation is best for making judgments and decisions. In fact, we believe that there is no right way of judgment and decision making in general. We are interested in what makes people trust their gut feelings, their affective reactions towards choice options and targets of judgment, as opposed to careful deliberation.

Affect in judgment and decision making

Our focus on the influence of happy versus sad mood states on reliance on emotional reactions versus analytical reasoning in judgment and decision making fits into the growing interest in the role of affect in judgment and decision making (e.g., Bechara, 2004; Cohen & Blum, 2002; Damasio, 1994; Kahneman, 2003; LeDoux, 1996; Peters & Slovic, 2000; Peters, Västfjäll, Gärling, & Slovic, 2006; Schwarz, 2000; Wilson, 2002; Zeelenberg, Nelissen, Breugelmans, & Pieters, 2008). Some researchers focus on affective influences on judgment and decision making, others on affective consequences. Moreover, different approaches study different forms of affect, including anticipatory affect that results from the decision or judgment task and incidental affect that is unrelated to the task at hand (see for an overview e.g., Finucane, Peters, & Slovic, 2003; Loewenstein & Lerner, 2003; Schwarz & Clore, 2007; Winkielman, Knutson, Paulus, & Trujillo, 2007). The belief in the importance of affect in judgment and decision making shared by those recent approaches contrasts sharply with classical decision theories.

Contrasting modern views to classical, normative models

Classical decision theories often state that affect only plays a small role in decision making, or if it does, it dilutes the otherwise rational, analytical decision making process (e.g., Von Neumann & Morgenstern, 1947). According to these normative models of decision making initially proposed by economists, in an ideal world, the assumption is that decision makers have complete information about the values and probabilities attached to different decision options, entirely understand this information, and use it to calculate and compare the advantages and disadvantages of each decision option (e.g., de Finetti, 1937; Savage, 1954; Von Neumann & Morgenstern, 1947; for an overview, see for example Baron, 2004; Hastie & Dawes, 2001).

However, actual human decision making often deviates from these assumptions (e.g., Kahneman, 2003; Kahneman & Tversky, 1979; Tversky & Kahneman, 1973; 1974).

In real life, we simply do not have enough time and cognitive resources for such careful deliberation about every single decision we need to make. According to Nobel laureate Herbert Simon (1957; 1983), we should think of human reason or rationality in terms of its efficiency in achieving goals rather than in terms of its consistency with normative rules. Simon argued that we should think of human rationality as "bounded" and "satisficing": Decisions are rational if they help us achieve a desired end state and do not take up too much of our time and energy to get there. If we would fully apply the rules of normative decision models, we might run the risk of "analysis paralysis", to be frozen into indecisiveness because of an explosion of options or endless deliberation on all the pros and cons involved (e.g., Damasio, 1994; Sadler-Smith, 2008). The neurologist Antonio Damasio (1994) described the indecisiveness of one of his patients, who suffered from a lack of emotional reactions due to brain damage and was unable to come up with a suggestion for the date of the next appointment, due to consideration of an endless amount of potential dates and the pros and cons involved with each of them. Affect might help us to at least *make* a decision. Moreover, affect might sometimes even help to make *good* decisions.

Affect and the quality of decisions

Affect can impact the quality of decisions, for better or for worse (e.g., Bechara, Damasio, Tranel, & Damasio, 1997; Damasio, 1994; Shiv, Loewenstein, Bechara, Damasio, & Damasio, 2005; Feldman Barrett & Salovey, 2002; Schwarz & Clore, 2007). It can have significant implications for an individual's well-being. For example, in the domain of health preferences, affect can have a pervasive influence on a patient's treatment decisions (e.g., Peters, Lipkus, & Diefenbach, 2006). Affect can impact the quality of decisions in various ways.

On the one hand, affect can disrupt judgment and decision processes. Sometimes, emotional reactions appear to distract decision makers from a rational strategy (e.g., Shiv et al., 2005). Moreover, affect can (over)load cognitive resources (e.g., Mackie & Worth, 1989; Seibert & Ellis, 1991), bias attention, perception and memory (e.g., Schwarz & Clore, 1988), and lure people into losing their self-control (e.g., Loewenstein, 1996). We sometimes make bad decisions or incorrect judgments because we are lost in anger, paralyzed by fear, blinded by love, or drowned in sorrow. In a distant past, reflex-like, uncontrollable emotional responses, such as "freezing" in front of a predator, might have helped our ancestors to survive, as suggested by

evolutionary models of affect (e.g., Darwin, 1872), but such hard-wired responses are not necessarily adaptive in our current environment.

On the other hand, affective reactions can also improve judgments and decisions (e.g., Feldman Barrett & Salovey, 2002). People lacking emotional reactions can have serious difficulty making good decisions; knowing without feeling appears insufficient for making good decisions (e.g., Bechara et al., 1997; Damasio, 1994). Based on prior experiences with a stimulus, affect can serve as a helpful warning signal or provide useful summarized information about the stimulus. Moreover, affect can prioritize the processing of important information by drawing our attention to it or by helping us to stay focused on this information. Affect can also help to construct preferences or serve as a "common currency", when different decision options are hard to compare (i.e., comparing apples to oranges) and it seems impossible to decide solely based on reason (e.g., Damasio, 1994; Peters, 2006).

The interplay of affective states and reactions in judgment and decision making

Previous research showed that the impact of affective states, or mood, on judgment and decision making can be pervasive (e.g., Bower, 1981; Bless, 2001; Forgas, 1995; Isen, 2000; Schwarz & Clore, 1988). For instance, mood has been found to color judgments. People use their current mood state as information and project their feelings on to a target of judgment, resulting in mood-congruent judgments (e.g., Schwarz & Clore, 1983; 1988; 2007). In a happy mood state, we appear to watch the world around us through rose-colored glasses and judge things positively, whereas in a sad mood state, we judge the world around us more negatively. Moreover, as outlined above, affective reactions can also have a great impact on judgments and decisions. Surprisingly, the interplay between affective states and affective reactions in judgment and decision making has so far been unexplored. While mood influences on judgment and decision making have already attracted quite a bit of attention from scientists, potential mood impacts on one of the most prominent distinctions in the field of judgment and decision making (i.e., the reliance on affective reactions versus logical analysis) have so far been neglected.

Tuning in: A matter of mood

We explore the idea that mood operates as a tuning mechanism, preparing people to judge and decide either intuitively or deliberatively. William James (1890) noted that "thinking is for doing". According to James, our cognitive processes serve our action. Our thoughts and feelings

might help us to behaviorally adapt to situational requirements. The proposed tuning function of mood in decision making in this dissertation stems from the notion of situated cognition (e.g., Clore et al., 1994; Schwarz, 2002). In that view, our cognitive processes are tuned to meet environmental needs; they are responsive to the environment in which we try to achieve our goals. These models hold that several factors fulfill a signaling function to inform us about the processing requirements we face. These factors include environmental safety and danger signals (or more generally: situational cues for the benign or problematic state of the environment we are in) as well as internal cues that have become associated with the problematic or benign nature of the environment, including an individual's mood state.

Mood states are typically assumed to reflect the general state of an individual, to be "barometers of the ego" (e.g., Jacobsen, 1957; Nowlis & Nowlis, 1956) and to function as a conditioned signal for the benign or problematic state of the situation we are in. Mood states often outlast the inducing event. Thus, our mood state can spill over from one situation into another. Whereas our mood states often provide us with correct information about the current state of the environment and can thereby automatically tune cognition and emotion so that they best serve the individual in its current context, tuning effects of mood are likely to occur regardless of the actual state of the environment (cf. Clore et al., 1994; Förster, Friedman, Özelsel, & Denzler, 2006; Schwarz, 1990; 2002).

In short, we argue that a cheerful mood imposes a tendency on decision makers, "prepares" decision makers, to rely on intuition, and that a somber mood results in an inclination to rely on thorough deliberation, but that mood is unlikely to force decision makers into intuition or deliberation. Tuning effects of mood can be overridden by other factors, such as an individual's goal, or task demands (Schwarz, 2002).

Mood and information processing

In line with the ideas above about the tuning of mood, a large body of empirical evidence indeed shows a differential impact of positive and negative mood state on information processing (e.g., Bless & Schwarz, 1999; Isen, 1999; Isen & Means, 1983; Hermsen, Holland, & van Knippenberg, 2008; Mitchell & Phillips, 2007; Schwarz & Clore, 2007). For instance, compared to a sad mood state, a happy mood state has been found to increase reliance on general knowledge structures, such as scripts (Bless et al., 1996) and stereotypes (Bodenhausen, Kramer, & Süsser, 1994). Moreover, in comparison to a sad or neutral mood state, a happy mood state appeared to increase associative processing (Bolte, Goschke & Kuhl, 2003; Hänze & Hesse,

1993; Isen, Johnson, Mertz, & Robinson, 1985; Storbeck & Clore, 2005) and reliance on the ease of retrieval heuristic (Ruder & Bless, 2003). In addition, a negative mood results in a stronger tendency to elaborate on information than a positive mood state (e.g., Bless, Bohner, Schwarz, & Strack, 1990; Fiedler, 1988).

Whereas tuning models provide a useful theoretical account for these findings, several alternative accounts are possible. Capacity models hold that positive affect reduces cognitive capacity, leaving individuals in a happy mood state with no choice but to rely on heuristic processing (e.g., Isen, Means, Patrick, & Nowicki, 1982; Isen, Daubman, & Nowicki, 1987; Mackie & Worth, 1989; 1991). Motivational models assume that, for a variety of reasons, a happy mood reduces processing motivation (e.g., Schwarz, 1990; Wegener & Petty, 1994). Some motivational models assume that individuals in a positive mood state are motivated to maintain their cheerful feelings, causing them to refrain from elaboration which is supposed to be a potential threat to their current mood state (e.g., Wegener & Petty, 1994; Wegener, Petty, & Smith, 1995). More detailed discussions of theoretical accounts for mood effect on information processing have been provided elsewhere (e.g., Martin & Clore, 2001). Jointly, these theories and models of mood impacts on information processing appear to substantiate the conclusion that a positive mood results in System 1 processing, whereas a negative mood induces an analytical, System 2 processing style. Embedded in this general framework, our core idea is that a happy mood state tunes in to reliance on affective reactions, whereas a sad mood state tunes in to reliance on logical analysis.

The current dissertation:
Mood and reliance on intuition versus deliberation in judgment and decision making

The primary aim of the current dissertation is to investigate the impact of mood states on reliance on intuition and deliberation in judgment and decision making. Taken together, there is ample evidence for the differential effect of positive and negative mood states on information processing (see for a review e.g., Clore et al., 1994; Schwarz & Clore, 2007). However, little is known about reliance on intuition versus deliberation in judgment and decision making as a function of mood states. The current dissertation provides the first empirical test of reliance on affective reactions versus thorough deliberation as a function of the mood state of a decision maker. Our second main objective is to further our understanding of the underlying mechanism

by which mood influences reliance intuition versus deliberation in judgment and decision making. We suggest a tuning account.

Overview of the empirical chapters

This dissertation consists of four empirical chapters describing studies that were designed to further our understanding of how sad and happy mood states impact judgment and decision making. The studies described in these chapters follow the following general format: In the first stage of each study, we manipulated (most studies) or measured participants' mood state. We used various methods to induce either a happy or a sad mood state. In the second part of our studies, we measured judgments and decisions of participants in these mood conditions, using a variety of established as well as newly designed paradigms.

The first three empirical chapters of this dissertation are concerned with the question how mood states influence reliance on feeling versus thinking in decision making. Chapter 2 considers the role of mood in intuitive decisions making. In three studies, the hypothesis was tested that compared to an incidental sad mood state, a happy mood state causes decision makers to more strongly rely on their gut feelings or affective signals. We investigated the impact of mood on decisions which participants made in a task commonly used to test intuitive decision making in laboratory settings: the Iowa gambling task.

Chapter 3 considers the complement of Chapter 2: It considers the influence of the mood state of decision makers on the extent to which they stick to simple, logical rules in decision making. Again, gambling paradigms were used. Study 3.1 tested the influence of induced sad versus happy mood states in investment decisions that require decision makers to follow a simple, logical rule to maximize expected profit. Study 3.2 employed a newly designed gambling paradigm, the Radboud University Logic versus Experience (RULE) task, to test the extent to which decision makers stick to a logical rule in a relatively simple gambling task. We hypothesized that decision makers in a sad mood would more strongly base their decisions on these simple and logical rules than decision makers in a happy mood state.

In Chapter 4, we tested our hypothesis about mood impacts on reliance on feeling versus thinking in another way, which also allowed us to more directly test our ideas about the tuning function of mood. Previous research, which mostly considered the fit between decision strategies and regulatory focus (i.e., focus on gains versus losses; e.g., Avnet & Higgins, 2006; Förster & Higgins, 2005), showed that fitting (versus non-fitting) decisions increase the subjective value of decision outcomes. Therefore, we expected that decision makers would value chosen outcomes

higher when their decision strategy matches their current mood state. We reasoned as follows: If a happy mood state indeed induces a tendency in decision makers to rely on intuition, it probably fits with deciding based on feelings towards various decision options (i.e., an intuitive decision strategy). And conversely, if a sad mood state indeed induces a tendency in decision makers to rely on deliberation, it probably fits with deciding based on a careful analysis of decision options (i.e., a deliberative decision strategy).

In the last empirical chapter (Chapter 5) of this dissertation, we aimed to further test the underlying mechanism by which mood might impact judgment and decision making. We investigated the influence of sad and happy mood states on the preference for prototypicality. This allowed us to more directly test our hypothesis about the tuning function of mood. People tend to prefer prototypical stimuli over less prototypical ones – an effect presumably reflecting affective reactions to familiarity (e.g., Bornstein, 1989; Winkielman, Schwarz, Fazendeiro, & Reber, 2003; Lee, 2001). This preference might depend on the extent to which individuals are tuned towards safety concerns (cf. e.g., Gigerenzer, 2008). We investigated whether mood changes the hedonic value of prototypicality. If a sad mood state indeed signals a problematic and potentially dangerous environment, tuning individuals towards safety concerns, familiarity is likely to be positive. Conversely, if a happy mood signals benign environments, this would make safety concerns less central and leave prototypes just average rather than positive. Therefore, we tested our hypothesis that compared to a sad mood, a happy mood would decrease the positive hedonic value of prototypes.

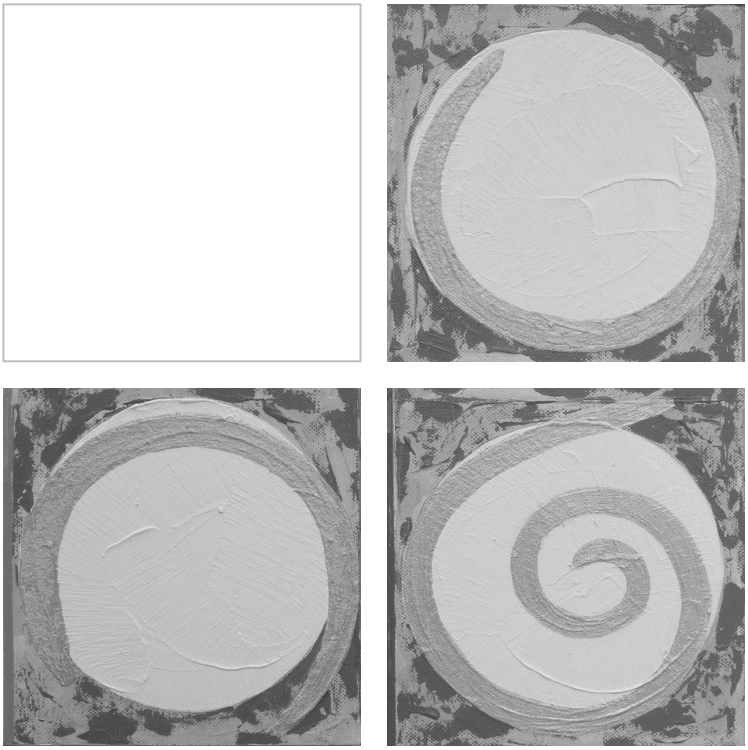
Concluding remarks

The remainder of this dissertation consists of four empirical chapters and a final discussion chapter. In this final chapter, I will integrate the empirical findings from previous chapters and consider key findings and implications of the empirical findings described in this dissertation. I will also suggest potential avenues for future research. The four empirical chapters that follow are all based on articles that have recently been published, or are under review or in preparation for potential publication in scientific journals. To ensure that these chapters can be read independently from each other, there is some overlap of content in the introductions and discussions.

Chapter 2

In the Winning Mood

Affect in the Iowa Gambling Task



Published as:

De Vries, M., Holland, R. W., & Witteman, C. L. M. (2008a). In the winning mood: Affect in the Iowa gambling task. *Judgment and Decision Making, 3,* 42-50.

The intellect has little to do on the road to discovery.
There comes a leap in consciousness, call it intuition or what you will,
and the solution comes to you and you don't know how or why.
(Albert Einstein in Moskowski, 1972)

Abstract

This research aimed to test the role of mood in the Iowa Gambling Task (IGT; Bechara, Damasio, Damasio, & Anderson, 1994). In the IGT, participants can win or lose money by picking cards from four different decks. They have to learn by experience that two decks are overall advantageous and two decks are overall disadvantageous. Previous studies have shown that at an early stage in this card-game, players begin to display a tendency towards the advantageous decks. Subsequent research suggested that at this stage, people base their decisions on conscious gut feelings (Wagar & Dixon, 2006). Based on empirical evidence for the relation between mood and cognitive processing-styles, we expected and consistently found that, compared to a negative mood state, reported and induced positive mood states increased this early tendency towards advantageous decks. Our results provide support for the idea that a positive mood causes stronger reliance on affective signals in decision-making than a negative mood.

Keywords: mood, decision-making, gut feelings, Iowa gambling task, intuition

Introduction

Many of us are familiar with the phenomenon that we feel that something is right or wrong, or that one choice option is better than another, without necessarily being able to explain where this "gut feeling" comes from or what it is based on. When people make a decision, one thing they can do is rely on such affective reactions towards decision-options. Decision-makers can also base their decision on a cognition-based, rule-governed and precise analysis of the different options. This distinction between decision-making based on feelings and decision-making based on thorough deliberation is a prominent distinction in psychology and decision-making research (e.g., Betsch, Hoffman, Hoffrage, & Plessner, 2003; Epstein, 1994; Evans, 2008; Hogarth, 2005; Kahneman, 2003; Lieberman, 2000; Wilson, 2002). The central question we ask here is whether mood is a moderator of people's reliance on feelings versus deliberation in decision-making. In line with others, we define mood states as diffuse affective states that are not linked to specific stimuli and that are relatively long-lasting (e.g., Frijda, 1986; Russell, 2003; see for differences between mood and emotions Zeelenberg et al., 2008). Based on empirical evidence for the relationship between mood and information processing (see Clore et al., 1994 for a review), we aim to explore whether people in a positive mood state are more likely to base their decisions on their gut feelings than people in a negative mood state.

Affect in decision-making

Cognitive psychologists have traditionally assumed that affective processes play only a small role in decision-making. However, some recent findings suggest that affect can in fact be important in decisions (e.g., Bechara et al., 1997; Cohen & Blum, 2002; Kahneman, 2003; Wagar & Dixon, 2006; Zajonc, 1980; and see the framework of emotional functions as proposed by Pfister and Böhm, 2008). For example, according to Damasio (1994), decision-processes may be based on affective signals. More specifically, people use somatic markers, that is emotion-based, physiological signals. These signals are formed in situations in which people repeatedly experience rewards or punishments. Reliance on such affective reactions towards different response options may play a particularly important role when decisions have to be made in an uncertain environment. In the present research we aim to investigate when such affective signals guide behaviour in a laboratory task that models decision-making under uncertainty: the Iowa Gambling Task (IGT).

In the IGT (Bechara et al., 1994; 1997) participants can win or lose money by picking cards from four different decks, two overall advantageous and two overall disadvantageous. Decks A and B, the bad decks, involve relatively high immediate rewards with the turning of each card, but even higher losses with the turning of some cards, resulting in an overall net loss for every 10 cards turned. Decks C and D are the good decks, with the combinations of moderate rewards with the turning of each card and relatively small losses with the turning of some cards resulting in an overall net gain for every 10 cards turned. At an early stage in this card-game, after experiencing the first big losses in the bad decks, players start to display a tendency towards the advantageous decks. Research suggests that this tendency is guided by affective signals (Bechara, Tranel, Damasio, & Damasio, 1996; Bechara et al., 1997; Damasio, 1994; Wagar & Dixon, 2006).

Our focus here is on the influence of mood on reliance on feelings in the IGT in this early stage of the game. Based on recent work (e.g., Dunn, Dalgleish, &Lawrence, 2006; Maia & McClelland, 2004; Wagar & Dixon, 2006), we define such feelings in the IGT as conscious gut feelings about which decks are good and which decks are bad. These arise early in the game, after the first high losses in the bad decks. Reliance on gut feelings can be contrasted to reliance on more certain, quantitative knowledge, arrived at through analytical thinking and detailed conscious processing. We believe that, compared to a negative mood, a positive mood causes people to rely more strongly on their gut feelings in the IGT. This would result in better performance early in the IGT in a positive mood than in a negative mood, due to a stronger feeling-based tendency towards the advantageous decks, when people are still highly uncertain (Maia & McClelland, 2004; Wagar & Dixon, 2006) about which strategy is right. We will now explain our ideas in more detail.

Initially, researchers from the Iowa laboratory (e.g., Bechara et al., 1994; 1997; Damasio, 1994) claimed that affective signals can operate not only consciously (as a "gut feeling" about the goodness or badness of a given response option), but also nonconsciously. However, evidence for the role of unconsciously operating affective signals in the Iowa gambling task has been reviewed critically (e.g., Dunn et al., 2006; Maia & McClelland, 2004). Dunn and colleagues (2006) argue that evidence for a lack of conscious knowledge that players in the IGT have about which decks are good and which decks are bad is weak. People's awareness about which decks are good and which decks are bad probably arises earlier in the game than other researchers previously claimed (e.g., Bechara et al., 1994; 1997; Damasio, 1994).

In the current chapter, we are concerned with the conditions related to people's reliance on conscious gut feelings in decision-making in the IGT. Maia and McClelland (2004) identified

three levels of awareness in the IGT (cf. e.g., Dienes & Scott, 2005, who made similar categorizations of different levels of awareness; and see Price & Norman, 2008). At Level 0, participants have no conscious knowledge at all about which decks are good and which decks are bad and they do not have a preference for the good decks. At Level 1, participants do show a conscious preference, but do not appear to have explicit knowledge about the basis for this preference. They are not able to explain why they prefer certain decks and they appear to base their behaviour on conscious gut feelings. At Level 2, participants have gained knowledge about the relative values involved in the decks and they can use this knowledge to explain their preference for the good decks. In other words, they have become conscious of another thing. They have explicit, fully verbalizable knowledge of the task itself, not just of their preferences. They have now reached full awareness in the IGT. Maia and McClelland (2004) provided evidence against the claim that affective signals can guide behaviour unconsciously, when awareness is still at Level 0. Based on this evidence, Dunn and colleagues (2006) conclude that the claim that affective signals can operate nonconsciously remains questionable and requires stronger empirical support.

We were interested in the question whether mood might moderate whether or not people would rely on gut feelings (or Level 1 awareness), early in the IGT. Wagar and Dixon (2006) provided evidence that consciously accessible affective reactions influence card selections early in the IGT, prior to Level 2 awareness. That is, participants began to choose advantageously before they were able to explain why. They formed affective signals, measurable in the form of galvanic skin responses (GSRs) to the different decks. They showed higher GSRs when they were about to select a card from a bad deck than when they went for a good deck. This difference in anticipatory GSRs was correlated with a subsequent behavioural preference for the good decks (Wagar & Dixon, 2006). Bringing together this evidence for affective guidance in the IGT prior to Level 2 (or full) awareness with the evidence against affective guidance when awareness is still at Level 0 (completely absent), we conclude that at an early stage of the IGT, people base their responses on conscious gut feelings towards the different decks of cards, that is Level 1 awareness.

Mood and gut feelings

The idea that people base their decisions on feelings at an early stage of the IGT is completely in line with previous research showing that judgments and decisions can be driven by gut feelings (e.g., Murphy & Zajonc, 1993; Strick, Holland, & Van Knippenberg, in press; Wilson, 2002; Wilson, et al., 1993; Zajonc, 1980). Reliance on gut feelings in decision-making may

fluctuate. People can rely on their first affective reactions towards various decision options, but they can also rely on a more careful, deliberative decision-strategy. If individuals adopt an analytical processing style, gut feelings are of less importance in guiding decision-making (e.g., Wilson et al., 1993). We suggest that the use of affect-based or deliberation-based decision-strategies may be moderated by mood. Based on empirical evidence for the relation between mood and cognitive processing-styles, we expect that mood might influence reliance on affective signals in the IGT, thereby affecting the tendency towards the advantageous decks in the early stage of the task.

Mood has consistently been found to influence the way that people process information (e.g., Bless & Schwarz, 1999; Bolte et al., 2003; Fiedler, 1988; Hänze & Hesse, 1993; Isen, 1999; Isen & Means, 1983; Ruder & Bless, 2003; Schwarz & Clore, 2007; see Clore et al., 1994 for a review; see Martin & Clore, 2001 for a discussion of theoretical accounts). A number of studies have shown that in a happy mood, people rely more strongly on general knowledge structures, such as stereotypes (Bodenhausen et al., 1994) and scripts (Bless et al., 1996) than in a sad mood. Moreover, in a sad mood, individuals are more likely to deliberate than in a happy mood. For instance, several studies showed a differential impact of argument strength under different mood states (see e.g., Bless & Schwarz, 1999 for a review).

Here, we focus on a different way in which mood can influence judgment and decision-making. Our core idea is that mood influences the reliance on feelings. Some of our recent results are in line with this idea. In a study manipulating mood and affect-based versus cognition-based, deliberative decision-strategies, we found that a positive mood matched well with affect-based decision-making, whereas a negative mood matched well with deliberative decision-making (De Vries, Holland, & Witteman, 2008b). Based on our idea that mood influences reliance on gut feelings, we expect that mood influences decision-making in the IGT. We suggest that people in a happy mood tend to rely on their feelings when they make decisions, which would enhance their performance in the IGT when awareness is at Level 1, while people in a sad mood are more cautious and rely on their feelings less.

The present research

The three studies reported in this paper aimed to test whether mood moderates the tendency towards the advantageous decks in the early stage of the IGT, when awareness appears to be at Level 1 (a preference for the good decks, without explicit knowledge about the basis for this preference) and affective signals apparently guide decisions in this card-game (Wagar &

Dixon, 2006). We suggest that, compared to a negative mood, a positive mood leads to stronger reliance on these affective processes. Therefore, we hypothesized that, in the early stage of the game, when awareness is at Level 1, people in a positive mood will choose more cards from the advantageous decks than people in a negative mood.

In order to test mood influences in the different stages of the IGT, with awareness increasing from Level 0 (absent) through 1 (gut feelings) to 2 (full awareness, with correct explanations), we focused on five subsequent blocks of 20 card selections (e.g., Bechara, Tranel, & Damasio, 2000; Evans, Bowman, & Turnbull, 2005). In the first stage of the game (roughly cards 1 to 20, Block 1), players sample the four decks. Participants start playing the IGT with no knowledge or experiences regarding the game at all. With awareness still at Level 0 (absent), we did not expect an effect of mood on choice behaviour in Block 1.

After participants have experienced the first losses in the disadvantageous decks, players begin to display a preference for choosing cards from the advantageous decks, but show no signs of knowledge about the basis for this preference, that is the values of the gains and losses involved in the different decks of cards. Awareness is at Level 1 and decisions appear to be based on affective guidance (Bechara et al., 1997; Wagar & Dixon, 2006). Wagar and Dixon (2006) consistently showed that around card 20 (the beginning of Block 2: cards 21-40), participants began showing an affective preference, as was shown by higher anticipatory GSRs towards the good (versus the bad) decks. Moreover, this difference in anticipatory GSRs was strongly correlated to a behavioural preference for the good decks in terms of card selections during those trials when awareness was still at Level 1 (gut feelings). In addition, participants were still highly uncertain about the right strategy in the game during the trials of Block 2 (Maia & McClelland, 2004; Wagar & Dixon, 2006). We were interested in mood influences on performance in this second stage of the game (Block 2), when awareness appears to be at Level 1. Later in the game, explicit, Level 2 awareness is acquired about the relative values involved in the four decks of cards, enabling participants to explain their preference for the advantageous decks and increasing their certainty about the right strategy to play the game (e.g., Bechara et al., 1997; Wagar & Dixon, 2006).

Our main focus was on Block 2 of the IGT. We hypothesized that people in a positive mood would outperform people in a negative mood in this second block. We did not expect mood effects in any of the other blocks. To test this hypothesis, we had participants play the IGT, after measuring (Study 2.1) or manipulating (Studies 2.2 and 2.3) their mood. Because of our a priori

prediction that mood would be related to IGT performance in Block 2 and not in any of the other blocks, we tested our prediction by looking at this specific Block 2 correlation in Study 2.1 or contrast in Studies 2.2 and 2.3 (Rosenthal & Rosnow, 1985). We also conducted additional analyses on the pooled data of the three separate studies, which enabled us to test the robustness of mood effects on performance in the IGT in an overall analysis.

Study 2.1

In this first study, we expected that naturally occurring differences in mood would be related to performance in Block 2 of the IGT, but not to performance in any of the other blocks.

Method

Participants. Fifty-three students from the Radboud University Nijmegen participated. They received three euros for their participation of 30 minutes.

Procedure. The experimenters, who were blind for condition and regarding the hypothesis under test, told participants that they would work on two independent studies. First, mood was assessed on a computerized 9-point response scale, anchored with 'not at all' and 'very much'. This scale consisted of three items (Cronbach's alpha = .78) to measure positive affect: 1. To what extent do you feel happy at the moment? 2. To what extent do you feel positive at the moment? 3. To what extent do you feel cheerful at the moment? Mood scores were obtained by calculating the mean score for each participant on this scale. After a short, unrelated filler task (drawing a map of the campus), the gambling task (IGT) was introduced to participants. We used the original, standard version of the IGT (Bechara et al., 1994). Participants were given a loan of €2000, - in play money, and had to draw cards from four decks in front of them. Beforehand, the total number of cards to be drawn (100) was unknown to the participants. Each card would generate a profit and, unpredictably, some cards would also generate a loss. The participants' task was to play in such a way that they would win as much money as possible. Participants had to learn by experience which strategy worked best. Playing mostly from the disadvantageous decks would lead to an overall loss (€250,- in every ten cards), whereas playing mostly from the advantageous decks would lead to an overall gain (€250,- in every ten cards).

Following a common way to score performance in the IGT, we calculated scores for the performance of each participant on the IGT for five consecutive blocks of 20 cards by subtracting the number of cards picked from the bad decks from the number of cards picked from the good

decks (e.g., Bechara et al., 2000; Evans et al., 2005). The higher a score, the more cards are drawn from the advantageous decks. The game lasted approximately 20 minutes. Finally, participants were paid, debriefed, and thanked for participation.

Results and Discussion

We calculated correlations between mood and the five IGT block scores. In accordance with our prediction, mood was found to be significantly related to performance in the second stage of the game (block 2: cards 21-40), after experiencing the first losses in the disadvantageous decks, $r(53) = .35$, $p < .011$. As expected, there were no significant correlations between mood and performance in the other blocks (block 1: $r(53) = -.08$, $p < .61$; block 3: $r(53) = -.03$, $p < .85$; block 4: $r(53) = -.20$, $p < .15$, & block 5: $r(53) = .04$, $p < .78$). These results support our ideas concerning the relation between reliance on affective guidance and mood; the more positive their mood state, the more cards participants chose from the advantageous decks. In Studies 2.2 and 2.3 we further explored these ideas by experimentally manipulating mood.

Study 2.2

In Study 2.2, we tested our prediction that mood would influence performance in the IGT. Specifically, we predicted that a positive mood would result in better performance in Block 2 of the IGT than a negative mood. We did not expect mood effects in any of the other blocks. To test our predictions, we first manipulated mood. Next, participants played the IGT.

Method

Participants and design. Fifty-two students from the Radboud University Nijmegen were randomly assigned to a positive or negative mood condition. For a participation of 30 minutes they received 3 euros.

Mood manipulation. Participants watched a short video clip (2.5 minutes) in order to induce either a positive or a negative mood state. In the positive mood condition they watched a funny fragment (from the Muppet Show), while in the negative mood condition they watched a sad fragment (from Schindler's List). These film clips have previously been shown to induce the mood state intended. After watching the positive mood fragment, participants scored significantly higher on a 9 point-mood scale than after watching the negative mood fragment (e.g., De Vries et al., 2008b).

Procedure. Participants were told that they would be working on two different studies. They were given instructions for the "first study", allegedly concerned with the evaluation of film clips, and for the "second study", the gambling task. Then, the experimenter left the room and participants watched the happy or sad video clip. The experimenter, who was blind for condition and regarding the hypothesis under test, subsequently re-entered the room and the gambling game immediately started. The procedure of the gambling task was identical to Study 2.1. Evaluation of the film clips took place at the end of the experiment, after the IGT. Participants were asked several questions about the film clip they had watched, such as "How did you like the film clip you watched earlier in this experiment?" When probed for suspicion, none of the participants was able to identify the goal of this study.

Results and Discussion

We tested whether mood influenced choice behaviour in the IGT. In Block 2, mood affected the number of cards chosen from the good decks minus the number of cards chosen from the bad decks. A t-test revealed that performance in block 2 was better for participants in the positive mood condition (M = 6.17) than for participants in the negative mood condition (M = 1.43), $t(50) = 2.14$, $p < .04$, Cohen's $d = .61$ (medium to large effect; Cohen, 1992), see Figure 2.1. Again, as expected, mood did not affect performance in any of the other blocks, (ps > .36).

Study 2.2 also supported our hypothesis that mood affects performance in the IGT, in the early stage of the game. Compared to a negative mood state, a positive mood state enhanced the tendency towards choosing cards from the advantageous decks. These results are in line with our idea that compared to a negative mood state, a positive mood state results in stronger reliance on feelings in decision-making.

In Study 2.3, we aimed to replicate our findings with the use of a computerized version of the IGT. One of the strengths of the IGT is its robustness in face of changes in the way it is administered, including whether it is administered manually or in a computerized form (Dunn et al., 2006). Use of a computerized version instead of a face-to-face version of the IGT would enable us to rule out any possible unwanted influences of the experimenter on the behaviour of participants.

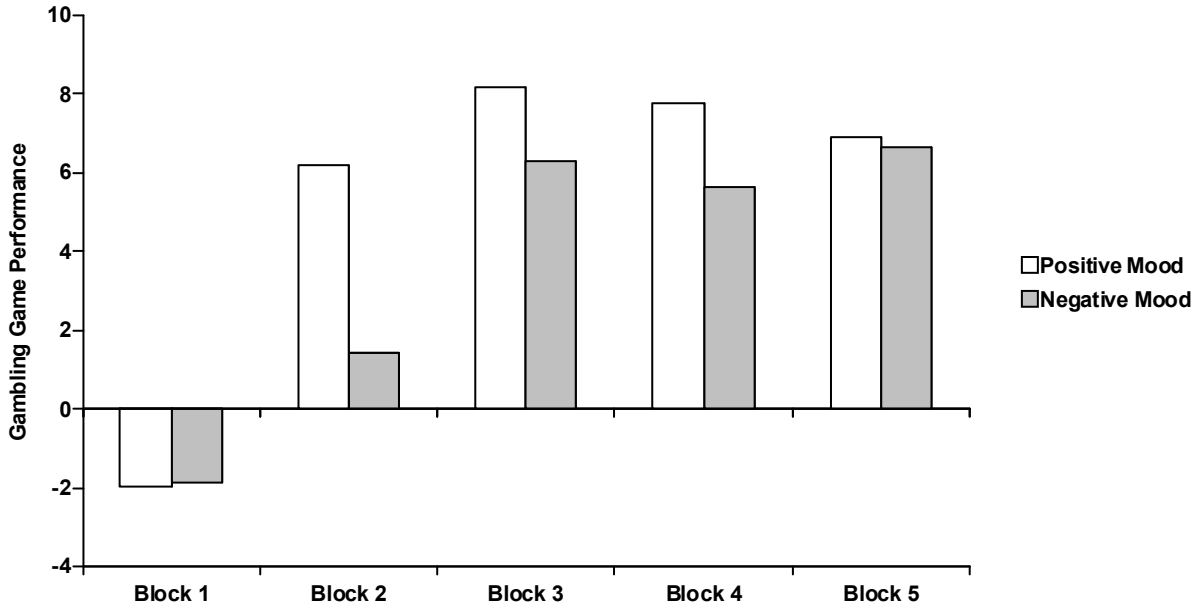


Figure 2.1. Gambling game performance as a function of mood. In block 2, players in the positive mood condition performed significantly better than players in the negative mood condition.

Study 2.3

Again, we predicted that a positive mood would result in better performance in Block 2 of the IGT than a negative mood. We did not expect mood effects in any of the other blocks. After a mood manipulation, participants played a computerized version of the IGT.

Method

Participants and design. Thirty-two students from the Radboud University Nijmegen were randomly assigned to a positive or negative mood condition. As in the previous studies, they received 3 euros for a participation of 30 minutes.

Procedure. Study 2.3 only differed from Study 2.2 in the use of a computerized version of the IGT instead of a face-to-face version. Except for the way of administration, this version of the IGT was similar to the standard, original version that we used in the previous studies. The four decks of cards were represented on the computer screen. To pick a card, participants could click on one of those four decks. Information on how much money they won by choosing this card would then appear in the middle of the screen. If the card they chose also resulted in a loss, information about how much money they lost would subsequently appear in the middle of the screen. During the game, a green bar in the top of the screen constantly represented the total

amount of money, which was updated after every decision. After 100 card pickings, the game automatically stopped. Finally, participants were debriefed, paid, and thanked for their participation. When probed for suspicion, none of the participants was able to identify the goal of this study.

Results and Discussion

We aimed to test whether the number of cards chosen from the good decks minus the number of cards chosen from the bad decks depended on mood state. Positive mood participants again outperformed negative mood participants in block 2 (*Ms* = 3.55 vs. -1.71), $t(30) = 2.30$, $p < .03$, Cohen's $d = .65$ (medium to large effect; Cohen, 1992), see Figure 2.2. No significant effects of mood on performance in blocks 1, 3 and 4 were obtained (*p*s > .37). Performance in block 5 was better for participants in the negative mood condition ($M = 12.86$) than for participants in the positive mood condition ($M = 5.77$), $t(30) = 2.88$, $p < .01$, Cohen's $d = .81$ (large effect; Cohen, 1992). Since this result has not been obtained in the previous two studies, caution about its interpretation is warranted. A possible explanation for this finding might be that participants in a negative mood rely on analytical information processing, and therefore prefer to base their decisions on explicit, Level 2 awareness, which has been well established by the end of the game.

Study 2.3 further illustrates the robustness of the effect of mood on decisions made in block 2 of the IGT. We replicated this effect in this study in which a computerized version of the IGT was used instead of a face-to-face version. Again, players in a positive mood performed better than players in a negative mood in the second stage of the game. By using a computerized version of the IGT, we could further standardize our procedure. While the experimenters in Studies 2.1 and 2.2 were blind for condition and regarding the hypothesis under test and therefore unlikely to have had an unwanted influence on the results, use of a computerized version further excludes possible influences of the experimenter on the decisions made by participants.

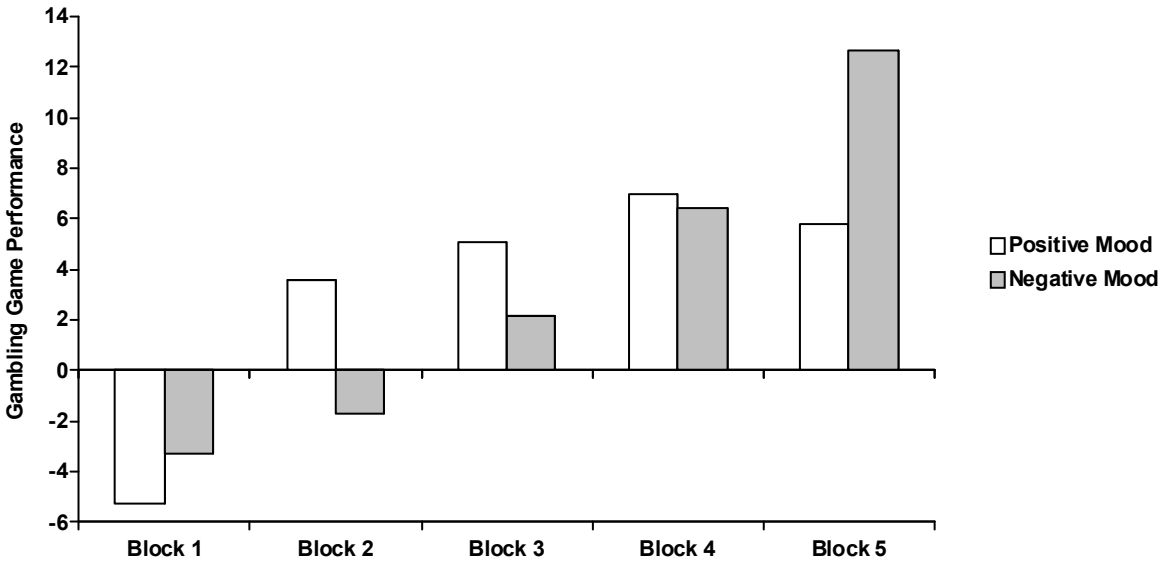


Figure 2.2. Gambling game performance as a function of mood. In block 2, players in the positive mood condition performed significantly better than players in the negative mood condition. In block 5, players in the negative mood condition performed significantly better than players in the positive mood condition.

Additional Analyses

In accordance with our predictions, we consistently found that mood was related to (Study 2.1), or influenced (Studies 2.2 and 2.3) performance in Block 2 of the IGT. These results are in line with our idea that a positive mood results in stronger reliance on gut feelings in decision-making. However, in Study 2.3, we also found that mood influenced performance in Block 5 of the IGT. While this result was not expected, it is in accordance with our general line of reasoning on how mood influences reliance on feelings and reliance on explanation-based knowledge. To be better able to judge how to interpret the results found in the three separate studies, we decided to perform additional analyses. By pooling the data of the three separate studies with relatively small numbers of participants, we could conduct an overall analysis that would allow us to draw stronger conclusions about how mood affects performance in the IGT. Specifically, we aimed to test the robustness of the mood effect in block 2 which we found in all studies, and of the mood effect in block 5 that we found only in Study 2.3.

The data of the three studies (N = 137) were pooled and analyzed in the following way. First, a correlation matrix for mood and the five IGT block scores was calculated for each study separately, with Study as a between subject factor in the design. Since Mood had only two

possible scores in Studies 2.2 and 2.3 (i.e., negative or positive), pointbiserial correlations were calculated for mood and each of the five IGT block scores in Studies 2.2 and 2.3. Next, we conducted a multiple regression analysis on the pooled within group correlations, with the five IGT block scores as predictors and mood as the dependent variable. This model significantly predicted mood scores, $F(5,136) = 3.34$, $p < .01$, $R^2 = .11$, Adjusted $R^2 = .08$.

Confirming our main hypothesis, performance in Block 2 was positively correlated with mood such that the more positive the mood state of the participant, the better the performance in this early stage of the IGT, Beta = .34, $t(131) = 3.89$, $p < .001$. None of the other block scores for performance in the IGT were significantly related to mood, see Table 1 for an overview of regression weights and correlations in our overall multiple regression model. Our finding that the relation between choice behaviour in the IGT and mood was significant only in the case of mood scores and block 2 implies that there is an interaction between block and mood, which is driven by block 2.[1] We therefore conclude that mood only influences performance in block 2 of the IGT. Performance in the other blocks does not seem to be affected by the mood state that players are in.

Table 1. Regression weights and correlations for IGT performance (Blocks 1-5) with mood in overall analysis on pooled data from Studies 2.1-2.3

				Correlations	
Predictor	Beta	T	p	Zero-order	Partial
Block 1	-.07	-.85	.40	-.05	-.07
Block 2	.34	3.89	.00	.30	.32
Block 3	.00	.01	.99	.05	.00
Block 4	-.08	-.88	.38	-.04	-.08
Block 5	-.07	-.77	.44	-.05	-.07

[1] The interaction between block and mood was also tested with repeated measures analyses of variance with mood as the between subjects factor (Studies 2.2 and 2.3) or as a continuous factor (Study 2.1) and block as the repeated measures factor. These analyses showed the same statistically significant interaction between mood and block.

General discussion

In three studies, we investigated the role of mood in the Iowa Gambling Task and demonstrated that mood affects performance on the IGT. We showed that naturally occurring differences in mood states (Study 2.1) as well as experimental manipulations of mood states (Studies 2.2 and 2.3), influenced decisions about card selections in the IGT. We consistently found that at an early stage of the IGT, after experiencing the first losses in the bad decks, participants in a happy mood state outperformed participants in a sad mood state. An additional analysis on the pooled data of the three reported studies confirmed that in block 2 of the IGT, people in a happy mood state chose more cards from the advantageous decks than people in a negative mood state.

We interpret our findings in terms of mood influencing reliance on affective signals in decision-making. In previous studies using the IGT, others (e.g., Bechara et al., 1997; Wagar & Dixon, 2006) have shown that players may base their decisions on affective signals towards decision alternatives during an early stage of the game, that is, before players are able to explain which alternatives are best. We focused on one of the factors that may facilitate or inhibit reliance on affective signals in decision-making. We suggest that an individual's mood state functions as a moderator of the type of process that guides decision-making. Specifically, in a happy mood state, people probably rely more strongly on affective reactions toward different decision-options, whereas in a sad mood state, people adopt a more careful, analytical decision-strategy.

Our research advances on studies concerning the link between mood and cognitive processing styles (e.g., Bless & Schwarz, 1999). We provide empirical evidence for the influence of mood on behavioural responses in a laboratory task that models decision-making under uncertainty. Previous studies showed that, compared to a negative mood state, a positive mood enhances reliance on general knowledge structures. The present studies suggest that, compared to a negative mood state, a positive mood state may increase reliance on affective cues as well.

While our results show that a positive mood can lead to better decisions than a negative mood, one should not infer that this always holds true. Whether a positive mood results in better decisions than a negative mood might largely depend on the decision task at hand. Several factors might play an important role here, and in future research several hypotheses with regard to such factors could be studied. For example, when faced with a decision task that requires decision-makers to follow strict rules in order to make good decisions, reliance on affective reactions might cause distractions from the optimal, analytical strategy (e.g., Shiv et al., 2005; see also

Dijksterhuis, Bos, Nordgren, & Van Baaren, 2006). In such cases, a sad mood seems to be more adaptive, because it may lead decision-makers to rely on their deliberations.

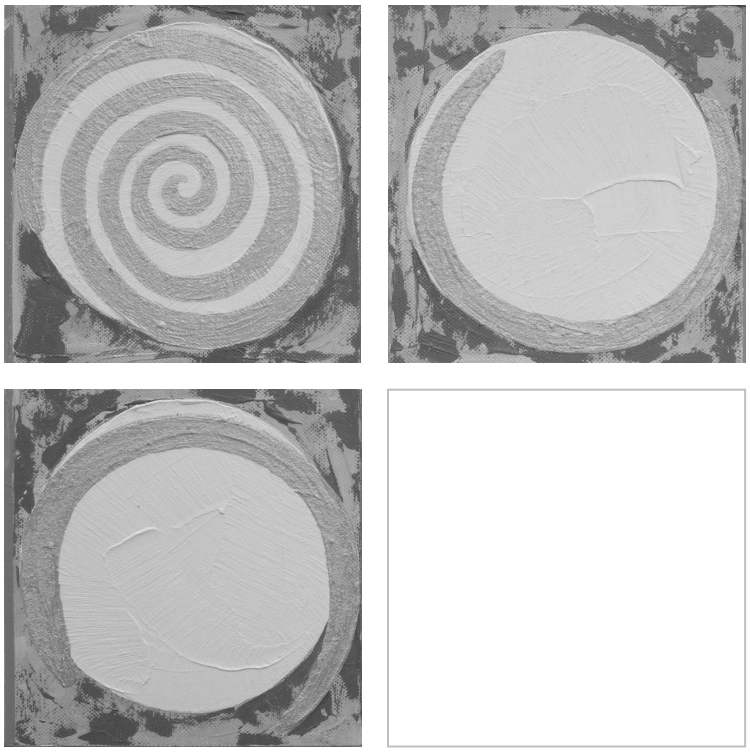
On the other hand, thinking too much can sometimes result in less optimal preferences and decisions and reduce satisfaction with decision-outcomes (Wilson et al., 1993; Wilson, 2002). Sad decision-makers might sometimes suffer from overanalyzing reasons for their preferences, resulting in suboptimal decision-outcomes. Another factor that might be important is the complexity of the task. Some recent findings suggest that thoughtful deliberation is not necessarily the best strategy when decision-tasks are complex in terms of the amount of information involved (e.g., Dijksterhuis, 2004; Wilson, 2002). Finally, mood can influence the subjective quality of decision-outcomes through its fit versus non-fit with a decision-strategy, with a negative mood resulting in a better subjective quality when a deliberative decision-strategy is applied and a positive mood resulting in a better subjective value when an affect-based, intuitive decision-strategy is applied (De Vries et al., 2008b).

To conclude, we believe that the mood state of the decision-maker can affect both the process and the quality of decisions, but that there is no "right mood" for decision-making in general. Our studies showed that, in an early stage of the Iowa Gambling Task, a positive mood is the winning mood.

Chapter 3

Simply Sad

Mood State Moderates Rule-Based Decision Making in Investment and Gambling Games



Submitted for publication as:

De Vries, M., Holland, R. W., Corneille, O., & Witteman, C. L. M. (2008). Simply sad: Mood state moderates rule-based decision making in investment and gambling games.

Abstract

We investigated the influence of sad and happy mood states on decision tasks that require the application of a simple, logical rule to make advantageous decisions. Participants made a series of investment decisions (Study 3.1) or a series of gambling decisions (Study 3.2) after a sad or after a happy mood manipulation. In both studies, participants made more logical decisions, in accordance with a simple rule, after a sad than after a happy mood manipulation. We conclude that sad and happy mood states that are incidentally induced have different impacts on simple, rule-based decision making.

Keywords:

Decision making, mood, rule-based decision strategy, investment behaviour, gambling

Introduction

Imagine that you are asked to make gambling decisions involving the following rule: In gamble A, you have a 50% chance of winning €1.00 and a 50% chance to win nothing. In gamble B, you have a 50% chance of winning €1.20 and a 50% chance to win nothing. The traditionally dominant view of decision making has been that decision makers should calculate expected values, or expected utilities, for the various decision options under consideration and subsequently choose the options with the best expected outcome. Decision making was assumed to be a predominantly cognitive process, in which affect only plays a small role, or at best negatively influences decision-making by causing distraction of a rational and optimal strategy. To maximize the expected outcome in the example given, you should always choose gamble B. If individuals would make fully logical decisions, they would always follow this simple, logical rule. However, individuals do not always rely on logic in decision making.

Recently, there has been a growing interest in the role of affect in decision making (e.g., Cohen & Blum, 2002; Damasio, 1994; Harlé & Sanfey, 2007; Kahneman, 2003; LeDoux, 1996; Peters & Slovic, 2000; Winkielman, Knutson, Paulus, & Trujillo, 2007). Research has examined the role of anticipatory as well as incidental affect (Loewenstein & Lerner, 2003). Consideration of the different decision options at hand can result in affective reactions, or anticipatory affect that is experienced at the time of decision making. However, this first approach does not take into account the influence of incidental affect, arising from factors unrelated to the decision. Incidental affect includes the dispositional as well as temporally induced mood state of the decision maker, an omnipresent factor in human decision making, naturally fluctuating as a function of good and bad experiences in our daily lives, including seemingly unrelated factors such as the weather conditions. Incidental affect can influence decision making in various ways, such as by altering the decision maker's perception of the desirability or probability of outcomes, by biasing perception, attention and memory in an affect-congruent way, or by affecting the nature and depth of information processing (e.g., Loewenstein & Lerner, 2003; Schwarz & Clore, 2007; Winkielman et al., 2007). Research on the role of incidental affect in decision making has not yet addressed the hypothesis that the mood state of a decision maker is a moderator of decision strategies in simple, rule-based decision tasks. We aim to test this hypothesis.

Although normative models of decision making assume that decision makers have complete information about the values and probabilities attached to different decision options,

that they understand this information, and use it to calculate and compare the advantages and disadvantages of each decision option (e.g., Von Neumann & Morgenstern, 1947), actual decision making often deviates from these assumptions (e.g., Kahneman, 2003; Tversky & Kahneman, 1974). When making a decision, individuals can use various strategies and rely on different ways of information processing. Which strategy is best seems to depend on the decision task at hand (e.g., Denes-Raj & Epstein, 1994). One important dimension appears to be the complexity of the decision task (e.g., Dijksterhuis, 2004; Wilson, 2002).

Here, we focus on simple decision tasks in which it is beneficial to use a deliberative, rule-based decision strategy. Dijksterhuis and colleagues (2006) showed that when decision tasks are simple, a deliberative, rule-based decision strategy is best. Another recent study showed that in a task requiring the application of a simple, logical rule, a lack of emotional reactions lead to more advantageous decisions (Shiv, Loewenstein, Bechara, Damasio, & Damasio, 2005). Mental states that facilitate rule-based processing may therefore enhance performance on this task. A sad mood state may precisely trigger such a mental state.

Mood states can be defined as relatively long-lasting diffuse affective states, or background feelings (Frijda, 1986; Russell, 2003). Inspired by empirical evidence for the influence of mood state on information processing (e.g., Bless & Schwarz, 1999; Fiedler, 1988; Schwarz & Clore, 2007; see Clore, Schwarz, & Conway, 1994 for a review; see Martin & Clore, 2001 for a discussion of theoretical accounts), we aim to test whether individuals in a sad mood state are more likely to base their decisions on a simple, logical rule than individuals in a happy mood state. This seems plausible, since mood has been shown to influence the scope (i.e., breadth or narrowness) of perceptual as well as conceptual attention. In a negative mood state, individuals adopt a narrower focus than in a positive mood state (Derryberry & Tucker, 1994; Isen, 2000). Such a narrow focus might facilitate rule-based decision making. Sticking to a logical rule requires cognitive control and serial rather than parallel processing of information. In terms of dual-processing models of judgment and decision making (e.g., Evans, 2008), in a sad mood, individuals are more likely to engage in analytical and serial (System 2) processing than individuals in a happy mood, who are more likely to engage in intuitive, parallel (System 1) processing. As sticking to a logical decision rule is a typical System 2 process, we expect sad decision makers to be more likely to do so than decision makers in a happy mood state.

The current research

We tested the impact of happy versus sad mood states on rule-based decision making. In Study 3.1, we used a decision task that was closely modelled on the investment task developed by Shiv and colleagues (2005). For Study 3.2, we designed a new decision task, the Radboud University Logic versus Experience (RULE) game, to further investigate the extent to which individuals base their decisions on a simple, logical rule. We expected that mood state would influence performance on these tasks, which require decision makers to follow a simple, logical rule to make good decisions. Specifically, we expected that sad decision makers would outperform happy decision makers.

Study 3.1

Method

Participants and Design. Forty-eight students from the Radboud University Nijmegen participated in exchange for a monetary reward. They were randomly assigned to either a happy or a sad mood condition. Seven participants were excluded form the analyses because they made the same response on each investment trial. This was unaffected by mood condition.

Materials and Procedure. Participants were welcomed and informed that the study consisted of several short and different parts, including an investment game and a part allegedly on media evaluation. They were first given the instructions for the investment game. Next, they watched a short video clip (from the Muppet Show or from Schindler's List). Manipulation checks have consistently shown that these film clips indeed induce the intended mood states (e.g., De Vries, Holland, & Witteman, 2008b). After the video clip, the instructions for the investment game (Shiv et al., 2005) were briefly repeated.

Participants were told that they would be making several rounds of investment decisions. We provided information about the values and probabilities for the two decision options per round. At each decision round, or trial, participants received a facsimile €10 bill and could decide whether or not they wanted to invest €10. Each time participants decided not to invest, they could keep the €10. Each time participants decided to invest, they handed over €10 to the experimenter and had a 50% chance of winning €25, but also a 50% chance of winning nothing. So, the expected outcome was €12.5 per trial for investment and €10 for non-investment, making investment the rational choice in this task. The more participants would stick to this rule, the

more often they would decide to invest rather than keep €10. Each time a participant chose to invest, a coin was flipped by the experimenter to determine the outcome. Unknown to participants, the game ended after 20 trials. Following others (e.g., Shiv et al., 2005), we scored decisions made by participants by calculating the mean percentages of trials in which participants decided to invest for four successive blocks of five trials. The experimenter was blind for the hypothesis under test.

Results and discussion

Preliminary analyses. In replication of previous findings (Shiv et al., 2005), we found that participants invested in the majority of trials (72%). This percentage gradually decreased over the course of the game. In the first as well as in the second block of five trials, participants decided to invest on 75% of trials on average, in the third block they decided to invest on 70% of trials, and in the last block on 68% of trials.

Main analyses. We expected that, compared to happy decision makers, sad decision makers would more often follow the simple rule that based on expected outcomes it is best to invest. The results for the first block of five investment decisions were in line with our prediction. In the happy mood condition, participants decided to invest in 63% of trials on average, whereas in the sad mood condition, participants decided to invest in 77% of trials on average, $t(39) = 2.05$, $p < .05$, *Cohen's d* = .66. Mood state did not influence investment decisions in the other three blocks, p's > .48.

The main result of this study is in line with our general idea that the mood state of a decision maker influences reliance on rule-based decision making. A sad mood manipulation increased the number of decisions to invest in the first block of trials in the game. So, after a sad mood manipulation, individuals made more rational investment decisions, in line with a simple, logical rule, than after a happy mood manipulation. Mood state did not influence gambling decisions in later blocks. A sad mood state resulted in good decisions in the first block, which might have improved the mood state of those sad participants, which in turn might have changed their decision strategy during the rest of the game. We addressed this point in our second study. Study 3.2 employed a task in which outcomes were the same for each participant. This way, decision outcomes would not differentially influence subsequent mood states and thus decision strategy over the course of the game. Moreover, a mood manipulation check was included.

Study 3.2

The second study served several objectives. First, we aimed to replicate the obtained mood state effect using a different decision task. Moreover, in Study 3.1, we did not test whether participants actually understood the rule. It is possible that not all participants did, and therefore they could not base their decisions on the rule. Note that we only expected mood impacts on the use of logical rules, and not on the understanding of such rules. Therefore, we now included an assessment of understanding of the rule. Finally, outcomes were the same for all participants and we included a mood manipulation check at the end of the game.

Method

Participants and Design. 105 students of the Radboud University Nijmegen participated in exchange for money and were randomly assigned to either a happy or a sad mood condition.

Materials and Procedure. The full study was computerized. Participants were informed that the study consisted of several parts and were first given the instructions for the gambling game. Next, participants watched a funny fragment from Jungle Book or a sad fragment from Sophie's Choice. After the video clip, the RULE game immediately started.

Participants made a series of choices between the following two gambles: In gamble A, they had a 50% chance of winning nothing and a 50% chance of winning €1.20. In gamble B, they had a 50% chance of winning nothing and a 50% chance of winning €1.00. To increase involvement, participants had a chance to actually receive the money they would win in a lottery. We counterbalanced (between participants) whether Gamble A or Gamble B was the gamble with the highest expected outcome.

We manipulated gamble outcomes in the following way: The first two trials in which participants chose the best gamble, they won. From the third trial onwards, participants did not win anything anymore. Our main dependent variable was the number of trials on which participants opted for the best gamble. Immediately after opting for the worst gamble, or after 20 trials (whichever came first), we asked participants to explain their choices.

After the RULE game, mood was measured on a 10-point scale, anchored with 'not at all' and 'very much'. This scale, which served as our manipulation check, consisted of six (alpha = .95) items, such as 'To what extent do you feel happy right now?' We also checked understanding of the logical rule by asking them the following open ended question: 'In gamble A, there is a 50% chance of winning nothing and a 50% chance of winning €1.20. In gamble B,

there is a 50% chance of winning nothing and a 50% chance of winning €1.00. Please, explain what you see as the right strategy to play this game.' The experimenter was blind for condition and for the hypothesis under test.

Results and discussion

Mood manipulation check. Participant's mood state was indeed significantly more happy after watching a fragment from Jungle Book (M = 7.71) than after watching a fragment from Sophie's Choice (M = 5.47), $t(103) = 7.47$, $p < .001$, *Cohen's d* = 1.47.

Other preliminary analyses. Our assessment of participants' understanding of the rule showed that the majority of participants did (65.7%, N = 69). Understanding was not affected by mood state, 36 out of 53 participants in the happy mood condition and 33 out of 52 participants in the sad mood condition understood that it was best to always choose the game with 50% chance to win 1.20, because this game had the highest expected value, Chi-squared (104, N = 105) = 1.13, $p < .57$. Since we were interested in the effect of mood state on the extent to which individuals follow a rule in decision making, our main analyses are based on the data of those participants who actually did understand the rational rule.

Main analyses. In line with our expectation, results showed that in a sad mood state, individuals stuck to the logical rule longer and more often chose the option with the higher expected value (M = 13.55 trials) than in a happy mood state (M = 9.81 trials), $t(67) = 2.57$, $p < .02$, *Cohen's d* = .63.[2] Importantly, participants' understanding of the rule was not affected by mood. Thus, it is not the case that happy participants understand less what is at stake; they understand the rule but simply do not follow it as strictly as sad participants. When explaining their choice for the worse gamble, participants typically answered that it was because they had not won any money during the last few trials, but that they knew they should have opted for the best gamble again. One of the participants explained this in the following way: 'Yeah, that was stupid… I should have chosen the other gamble of course… but I had not won anything for a while…'.

[2] Excluding those participants who chose the best game on all 20 trials yields the same, significant pattern of results. In the sad mood condition, the proportion of participants who always chose the best game was 11 out of 33, whereas in the happy mood condition, this was 6 out of 36, Chi squared (68, N = 69) = 2.58, $p < .11$.

General Discussion

In two studies, we found support for our idea that in a sad mood state, individuals stick to an advantageous rule-based decision strategy longer than in a happy mood state. In both studies, sad individuals made more rational decisions than happy individuals. The second study showed that mood state did not influence understanding of the rule itself. In a sad mood state, participants just stuck to the logical rule longer.

These findings advance on previous insight into the impact of mood states on decision strategies. In a recent study manipulating mood state and affect-based versus cognition-based, deliberative decision strategies, we found that a happy mood state matched well with affect-based decision making, whereas a sad mood state matched well with deliberative decision making (De Vries et al., 2008b). In another line of research, we found that in a complex task, happy mood individuals appeared to rely on their gut feelings more and outperformed sad mood individuals (De Vries, Holland, & Witteman, 2008a). Other recent studies show that negative affect decreases automatic reactions to affective stimuli (Vermeulen, Corneille, & Luminet, 2007; Vermeulen, Luminet, & Corneille, 2006). The current results show the complement: In a simple decision task, sad mood individuals appear to more strongly rely on a logical rule and outperform happy mood individuals.

Since reliance on different decision strategies may affect the quality of decision outcomes, it is important to gain more insight in the factors that influence which strategy individuals use. When decision tasks are relatively simple, deliberation has been shown to result in better outcomes than intuition. A sad mood state results in more deliberation and consequently better decisions than a happy mood state. Our finding can be interpreted as sad decision makers being smarter or wiser in simple tasks. Indeed, in such tasks it is profitable for decision makers to stick to logical rules that increase expected outcomes, even in the face of temporal failures. If for example investors, consumers, or psychologists need to follow a strict rule to make the best decisions, it appears to be wise to be sad.

However, we live in an uncertain world and we often cannot be sure about the expected outcomes of different decision options. When negative outcomes persist, it might actually be a viable strategy to deviate from a seemingly logical rule and try alternative strategies that are not fully understood yet by logic. In a dynamic and uncertain world, individuals in a happy mood state might often profit from their open-minded and creative processing style (e.g., Isen,

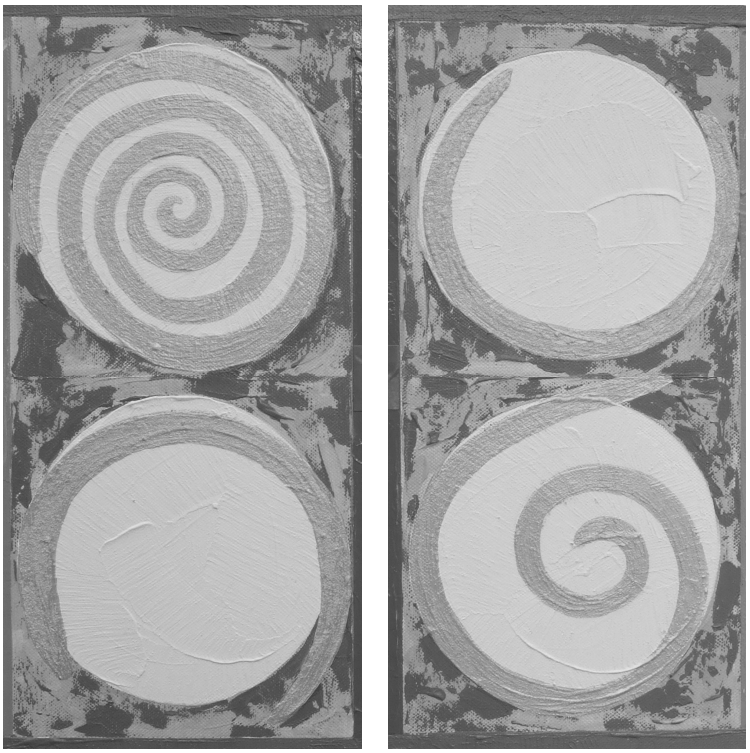
Daubman, & Nowicki, 1987), testing new and innovative solutions when an established strategy fails. From this perspective, in a gambling game in which you understand the logical rule, but keep experiencing bad outcomes when applying it, switching might actually be a viable strategy.

To conclude, our studies advance insight in the role of affect in decision making. Mood influences the way individuals make decisions, but there seems to be no straightforward answer to the question which mood state is most advantageous. We believe that there is no right mood in general. Our mood states naturally fluctuate, constantly influencing the way we process information and make decisions. This dynamic system gives us different perspectives on the world and on the decision tasks we face, enabling us to constantly adapt to new outcomes and experiences. Focusing on the mood state of decision maker is a fruitful avenue for future research into the role of affect in decision making, furthering our understanding of the interplay of affect and cognition. Depending on factors such as the complexity of the decision task, it can be advantageous to be simply sad, but also to be holistically happy.

Chapter 4

Fitting Decisions

Mood and Intuitive versus Deliberative Decision-Strategies



Published as:

De Vries, M., Holland, R. W., & Witteman, C. L. M. (2008b). Fitting decisions: Mood and intuitive versus deliberative decision strategies. *Cognition and Emotion, 22,* 931-943.

Abstract

We investigated the influence of the compatibility between mood and decision-strategies on the subjective value of a decision-outcome. Several studies have provided evidence for the idea that a sad mood induces people to analyze information carefully, probably fitting well with a deliberative decision-strategy. In a happy mood, people tend to more strongly act on their feelings, probably fitting well with an intuitive decision-strategy. However, sometimes the situation demands the use of decision-strategies that seem incompatible with mood states. We expected that decision-makers would value a decision-outcome higher in case of a fit between mood and decision-strategy than in case of a non-fit. After a mood manipulation, participants were instructed to decide either based on their first affective reaction or after deliberation. Results confirmed our expectations: Fitting decisions enhanced the subjective value of a decision-outcome.

Keywords: Decision-making, mood, decision-strategies, fit, intuition

Introduction

When people make a choice between different alternatives, one thing they can do is rely on their intuition, that is, base their decision on the first affective reactions that come to mind. They could also decide deliberately, i.e. analyze the pros and cons of different options before making a decision. Irrespective of the outcome itself, such intuitive versus deliberative decision-strategies may influence how much people value their decision-outcome (see also e.g., Avnet & Higgins, 2006).

According to Higgins, Idson, Freitas, Spiegel, and Molden (2003), when people "feel right" about a strategy they are using, they experience value. This value transfers to the chosen outcome. Linking these ideas to intuition versus deliberation, it is important to know when it feels right to rely on feelings and when it feels right to thoroughly deliberate before deciding. We focus on mood as a potential moderator. We define mood states as diffuse affective states that are not linked to specific stimuli and that are relatively long-lasting (see e.g., Frijda, 1986). We focus on whether choosing in a way that fits a person's mood state makes them value a chosen alternative more.

Mood and intuitive versus deliberative decision-making

Deliberative decision-making is cognition-based, rule-governed, analytical, precise and slow. Deliberating decision-makers take their time to thoroughly analyze the positive and negative aspects of different options. Such deliberate decision-making can be contrasted to intuitive decision-making, which is characterized by a sense that something is right or wrong, or that one option is better than another, without necessarily being able to explain where this "gut feeling" or intuition comes from. We understand intuitive decision-making as decision-making based on this kind of feelings (see also e.g., Kahneman, 2003; Lieberman, 2000).

Interestingly, the degree to which people process information deliberatively or intuitively has been found to depend on affective states. Advancing on dual-process models of information processing, it has been shown that in a sad mood, individuals are more likely to deliberate than in a happy mood (e.g., see Clore, Schwarz, & Conway, 1994 for a review; see Martin & Clore, 2001 for a discussion of theoretical accounts). For example, Fiedler (1988) has shown that in a sad mood, people produce fewer inconsistencies in a multiattribute decision task than in a happy mood. Moreover, several studies have shown a differential impact of argument strength under different mood states (see e.g., Bless & Schwarz, 1999 for a review). That is, in a sad mood

individuals are more likely to engage in systematic elaboration than in a happy mood. Hence, sad individuals are strongly persuaded by strong arguments, but not by weak arguments, whereas happy individuals are moderately persuaded by strong as well as weak arguments.

Furthermore, there is some evidence that happy mood individuals respond more intuitively than those in a sad mood (e.g., Bolte, Goschke, & Kuhl, 2003; Isen & Means, 1983). For example, mood influences the ability to make intuitive judgments (Bolte et al., 2003). Happy individuals outperformed sad individuals in intuitively judging whether or not word triads (e.g., "playing, credit, report") were coherent, i.e., had a common weak associate ("card") that they were not consciously aware of. A happy mood induces a heuristic, intuitive mindset, probably fitting well with intuitive decision-making, but less well with deliberate decisions. A sad mood, on the contrary, induces a deliberative mindset, with fitting decisions most likely made deliberatively, after thoroughly analyzing the pros and cons.

Fitting decisions

The mood state of the decision-maker may not always match the manner in which the decision-maker decides. This might seem strange at first sight. Why would decision-makers in a happy mood not base their decisions on their first feelings if that is what feels like the right thing to do for them? And likewise, could not sad decision-makers simply base their decisions on thoroughly analyzing the positive and negative aspects of various options? The answer is no, not always. Sometimes, the situation demands the use of another strategy. For example, a decision-maker in a sad mood may not have enough time to deliberate extensively before making a decision. Or happy mood decision-makers may need to carefully deliberate before they decide, because they have to justify their decision. Hence, the decision-strategy we use may not always fit our current mood state. Recent studies suggest that such a fit or non-fit may have important consequences for the subjective value of the decision-outcome (e.g., Avnet & Higgins, 2003; Higgins et al., 2003).

Most studies on fit have been conducted in the domain of regulatory focus. Promotion oriented people are generally concerned with the presence or absence of positive outcomes, and prevention oriented individuals with the presence or absence of negative outcomes. Higgins and colleagues (2003) had participants make a choice between a mug and a pen they would receive as a gift. That is, half of the participants were told to think about what they would gain by choosing the mug and what they would gain by choosing the pen. The other half was instructed to think about what they would lose by not choosing the mug and what they would lose by not choosing

the pen. Results showed that promotion oriented individuals valued the chosen outcome higher when they focused on gains (fit) rather than losses (non-fit). In contrast, prevention oriented individuals valued their decision-outcome more when they focused on losses rather than gains.

In addition, some recent studies have shown that a fit-effect can also be caused by a match between situationally induced information processing-styles and instructed decision-strategies (Avnet & Higgins, 2003; Förster & Higgins, 2005). For example, focusing on a whole rather than on parts (global processing) fits a choice strategy that focuses on gains. In contrast, focusing on parts (local processing) fits a choice strategy focusing on losses. A fit between information processing-style and choice strategy resulted in a higher subjective value of the chosen object than a non-fit (Förster & Higgins, 2005).

In short, several studies have illustrated fit-effects in decision-making. However, fit-effects as a function of mood have not been studied yet. Moreover, little is known about fit-effects with intuitive versus deliberative decision-strategies. This is surprising, given the centrality of the distinction between deciding based on feelings versus analytical thought in psychology and decision-making research (e.g., Dijksterhuis, 2004, Wilson, 2002). Very recently, Betsch & Kunz (2008) showed a fit-effect of intuitive versus deliberative decision-strategies with dispositional preferences for intuitive versus deliberative decision-making. Intuitive decision-makers generally prefer to decide based on their feelings. In contrast, deliberative decision-makers have a stable preference for decision-making based on thoroughly analyzing the pros and cons of various decision options. Individuals were classified according to their preferences for intuitive and deliberative decision-making. When the dispositionally preferred decision-mode matched an instructed decision strategy (intuitive vs. deliberative), the perceived value of a chosen object was higher than in case of a non-match (see also Avnet & Higgins, 2006).

The present study

The primary goal of our study was to investigate whether fit-effects could be obtained by manipulating both people's mood states and their decision-strategies. We expected to obtain fit-effects when a mood manipulation is crossed with a decision-strategy manipulation. A happy mood state is compatible with intuitive decision-making, and a sad mood state with thoughtful, deliberative decision-making. Thus far it is unknown whether and how this compatibility, or fit, between mood states and decision-strategies influences decision-making. We aimed to investigate the consequences of such a fit for the subjective value of a decision-outcome. We hypothesized that intuitive decision-making in a happy mood and deliberative decision-making in a sad mood

would result in a higher subjective value of a chosen object than intuitive decision-making in a sad mood and deliberative decision-making in a happy mood state.

Second, following recent research by Betsch and Kunz (2008), we aimed to demonstrate a second fit-effect with intuitive versus deliberative decision-strategies by focusing on dispositional preferences for such decision-strategies (Betsch, 2004). In case of a match between these stable, dispositional preferences and an instructed decision-mode, we expected to replicate a fit-effect, i.e. enhanced subjective value of a chosen alternative (cf. Betsch and Kunz, 2008). Specifically, intuitive decision-makers who decide based on their first feelings and deliberative decision-makers who decide deliberatively are expected to value their chosen object higher than intuitive decision-makers deciding deliberatively and deliberative decision-makers basing their decision on their first feeling.

Method

Overview

First, we manipulated mood. Next, participants made a decision, either intuitively or deliberatively, which of two different looking thermoses they would like to win in a lottery. Subsequently, participants estimated the value of the chosen thermos. Finally, we measured mood and preferences for intuitive and deliberative decision-strategies.

Participants and Design

Participants were 77 students (51 female, 26 male) from the Radboud University Nijmegen. They were randomly assigned to conditions in the 2 (Mood: happy vs. sad) x 2 (Decision-strategy: intuitive vs. deliberative) between-subjects design.

Materials and Procedure

Participants were led to individual cubicles. The experimenter, who was blind for hypothesis and condition, explained that all the instructions would be given on the computer screen and left the room. Participants were informed that the study consisted of several short and different parts and that a thermos would be raffled between all participants. In the first part, allegedly on media evaluation, they watched a short video clip (2,5 minutes), meant to elicit either a happy or a sad mood state. In the happy-mood condition participants watched a funny fragment (from the Muppet Show), in the sad-mood condition they watched a sad fragment (from Schindler's List).

The next part was the lottery (Betsch & Kunz, 2008). Participants saw pictures of two different thermoses. Decision-mode was manipulated. In the intuitive choice condition, participants were asked "Based on your first feelings, please indicate which of the two thermoses you prefer to win in the lottery." The instruction for participants in the deliberate choice condition was as follows: "Please have a close look at the thermoses and think of the pros and cons for each thermos. Take your time. Next, please indicate which of the two thermoses you prefer to win in the lottery." Right after the choice had been made, all participants estimated the monetary value of the chosen thermos (in Euros). This measure of subjective value of the chosen alternative served as our main dependent variable.

After the lottery, mood was measured on a 9-point scale, anchored with 'not at all' and 'very much', consisting of five items (Cronbach's alpha = .95), e.g., "To what extent do you feel happy at the moment?". Then, participants filled in the Preference for Intuition and Deliberation (PID) questionnaire (Betsch, 2004) in order to measure preferences for intuitive and deliberative decision-making strategies. This questionnaire comprises 18 items, nine indicating the preference for intuition (Cronbach's alpha = .79), e.g., "I listen carefully to my deepest feelings", nine other items indicating the preference for deliberation (Cronbach's alpha = .82), e.g., "I prefer making detailed plans rather than leaving things to chance". Preference for intuition and preference for deliberation were not correlated, $r(77) = -.15$, *ns*. Based on these data participants were classified as intuitive when they scored above the median on the intuition scale *and* below the median on the deliberation scale, and as deliberative when they scored above the median on the deliberation *and* below the median on the intuition scale. In this way, clear groups were created (Betsch, 2004; Betsch & Kunz, 2008). Finally, participants were debriefed, paid, and thanked for their participation.

Results

Manipulation checks

In all analyses, gender was included as an additional factor. No effects involving gender were significant. In order to test whether the video clips induced the intended mood states, a 2 (Mood Condition: happy vs. sad) x 2 (Decision-Mode: intuitive vs. deliberative) analysis of variance with reported mood as dependent variable was conducted. The main effect of Mood Condition was significant, $F(1,76) = 26.41$, $MSE = 1.44$, $p < .001$. Participants' mood was

significantly more happy after watching a funny video fragment (M = 6.65, SD = .20) than after watching a sad video fragment (M = 5.11, SD = .23). No other effects were found, F's < 1.

In order to test whether the instruction to decide intuitively versus deliberatively successfully influenced the way participants made their decision, a 2 (Mood Condition) x 2 (Decision-Mode) analysis of variance with the time taken to make a decision (in seconds) as dependent variable was conducted. The main effect of Decision-Mode was significant, $F(1,76)$ = 47.43, MSE = 129.41, $p < .001$. Deciding took longer in the deliberative (M = 26.00, SD = 1.88) than in the intuitive (M = 6.40, SD = 2.14) Decision-Mode condition. No other effects were found, F's < 1.

Fitting decisions: Mood and intuitive versus deliberative decision-strategies

We had predicted that, compared to a non-match, a match between mood and the instructed decision-mode would result in a higher price assigned to the chosen thermos. In accordance with our prediction, a 2 (Mood Condition) x 2 (Decision-Mode) analysis of variance with estimated price as dependent variable yielded a significant Mood Condition x Decision-Mode interaction, $F(1,76)$ = 5.04, MSE = 23.63, $p < .03$. When mood state fit with decision-mode, the estimated price was significantly higher than when mood state did not fit with decision-mode, see Figure 4.1. Specifically, making a choice based on first feelings in a happy mood, or after thinking of pros and cons in a sad mood, led to a higher estimated value of the chosen thermos than making an affect-based choice in a sad mood, or a thought-based choice in a happy mood.[3] No main effects were obtained, F's < 1.

[3] Simple effect tests showed a marginal significant Mood effect for the deliberative decision-mode, $F(1,73)$ = 3.48, MSE = 23.56, p <.07 and no effect for the intuitive decision-mode, F < 1.

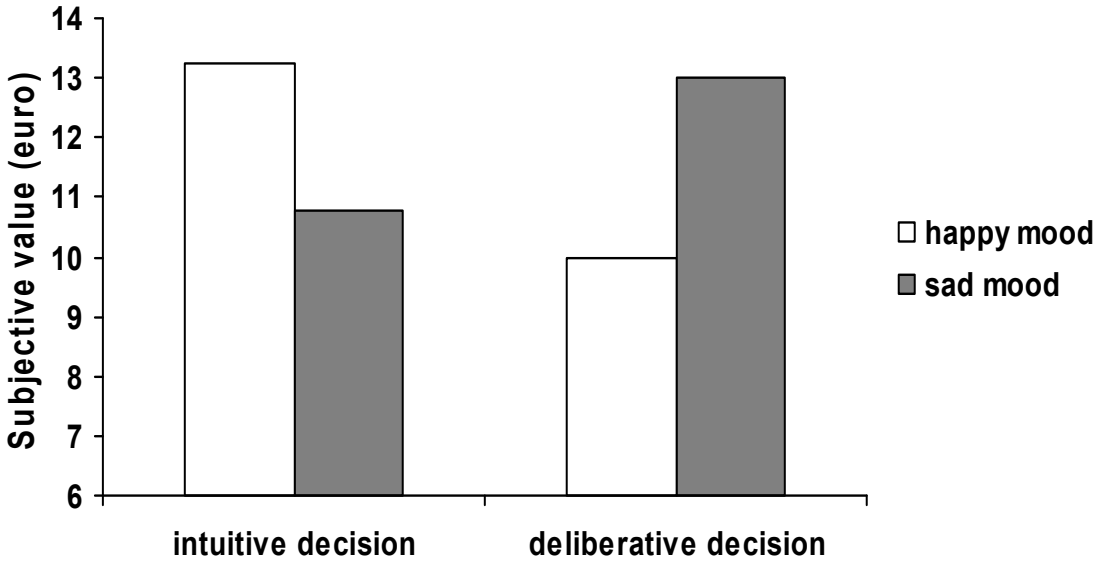


Figure 4.1. Subjective value of chosen object as a function of Mood and Decision-Mode.

Fitting decisions: Dispositional preferences and intuitive versus deliberative decision-strategies

The following results are based on the data of those participants who were classified in the clear groups, i.e. unambiguously as either intuitive (N = 22) or deliberative (N = 25) decision-makers, following the classification method by Betsch and Kunz (2008). It is important to note that, since we measured dispositional preferences at the end of our study, scores on those dispositional scales were not affected by our manipulated variables, i.e. Mood and Decision-Mode. No main effects were found, F's < 1, and the interactions were not significant, $F(1,76) = 2.39$, $MSE = .33$ for Preference for Intuition, and $F(1,76) = 1.87$, $MSE = .33$ for Preference for Deliberation.

A 2 (Preferred Decision-Mode: intuitive vs. deliberative) x 2 (Instructed Decision-Mode: intuitive vs. deliberative) x 2 (Mood Condition: happy vs. sad) analysis of variance with estimated price as the dependent variable yielded a significant Preferred Decision-Mode x Instructed Decision-Mode interaction, $F(1, 46) = 5.06$, $MSE = 19.46$, $p < .04$. Participants with a dispositional preference for intuitive decision-making who were instructed to make an intuitive decision and those with a dispositional preference for deliberative decision-making and the instruction to make a deliberative decision experienced fit. Those participants assigned a higher

value to the chosen thermos than participants who did not experience fit, see Figure 4.2.[4] No further effects were obtained.

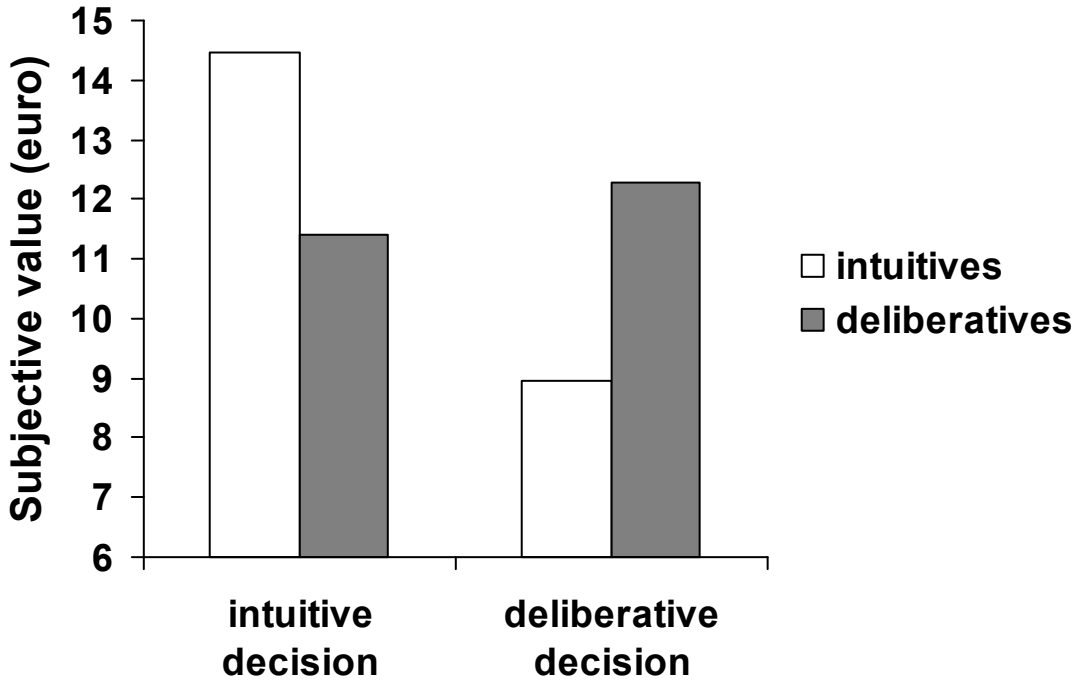


Figure 4.2. Subjective value of chosen object as a function of Dispositional Preference and Decision-Mode.

Discussion

The main purpose of this article was to investigate fit-effects between mood states and intuitive versus deliberative decision-strategies. Our study illustrated that in case of a fit between mood and decision-strategy, the subjective value of the outcome of a decision process is higher than in case of a non-fit. Deciding intuitively in a happy mood state or deliberatively in a sad mood state resulted in a higher subjective value of the chosen outcome than deciding intuitively in a sad mood state or deliberatively in a happy mood state. Moreover, we found evidence for a second type of fitting decisions. People with a dispositional preference for intuitive decision-making value their decision-outcomes more when they base their choices on their first affective reaction

[4] Simple effect tests showed a marginal significant Dispositional Preference effect for the intuitive decision-mode, $F(1,39) = 3.22$, $MSE = 20.98$, $p < .09$ and no effect for the deliberative decision-mode, $F(1,39) = 2.79$, $MSE = 20.98$.

towards the choice options. In contrast, deliberation on pros and cons enhances the perceived value of decision-outcomes in people with a stable preference for deliberative decision-making (cf. Betsch & Kunz, 2008).

Our study contributes to the discussion of the role of mood in judgment and decision-making. First, although mood can alter decision-outcomes by means of several processes (see for an overview Schwarz & Clore, 2007), our study is the first to show that mood affects decision-outcomes via its fit or non-fit with the way in which a decision is made. Second, whereas the link between negative mood and deliberative, analytical processing has been demonstrated repeatedly (e.g., Fiedler, 1988), the relation between positive mood and intuitive processing has so far received far less attention (see for an exception e.g., Bolte et al., 2003). Although the influence of mood on reliance on heuristics and general knowledge structures has been well established (see e.g., Bless & Schwarz, 1999), previous studies do not speak to the idea that positive mood states can also influence reliance on affective reactions towards decision-options. The current results are in line with recent findings obtained in our lab showing that positive mood individuals are more likely to rely on the first feelings that come to mind (De Vries, Holland, & Witteman, 2008a).

Our results also extend previous research on fit-effects in several ways. First, most studies have focused on regulatory focus. Our study may be added to the few studies (e.g., Avnet & Higgins, 2003) that obtained fit-effects outside this domain. Together with these previous findings, our study shows that fit-effects can be considered a broader phenomenon than regulatory fit only. Second, the fact that we studied fit-effects employing a mood manipulation has implications for understanding the nature of fit-effects, or at least for understanding what fit is not. According to Higgins and colleagues (2003), fit-effects are distinct from general mood effects. Mood effects as a function of regulatory fit have never been found (for a review see Avnet & Higgins, 2006). In the present study, again we did not find an influence of fit on mood. Moreover, if mood would mediate the relation between fit and value, a main effect of mood on value would be expected. However, our finding that value was influenced by fit, but not directly by our (successful) mood manipulation, further supports the idea that mood is not the mediator of value changes in fit-effects.

Why does fit enhance value?

Higgins and colleagues (2003) explained fit-effects in terms of a feeling of rightness with regard to the strategy employed. In case of fit, " … [people] feel right about what they are doing

and this value experience transfers to the value experience involved in subsequent object evaluation" (Higgins et al., 2003; p. 1151; see also e.g., Avnet & Higgins, 2006). The question remains where this "*feeling right*" comes from and how exactly it transfers to the outcome.

One possible mechanism, by which fitting decisions can result in a higher value of the chosen outcome than non-fitting decisions, is that they create a positive hedonic value, which decision-makers then misattribute to their decision-outcome. In case of fit, situational demands are in line with an individual's current orientation. People can rely on their ongoing strategy, which feels natural and easy to them. They perceive their decision-process as fluent. The experience of fluency induces positive hedonic value, and this in turn results in more favourable evaluations (e.g., Winkielman, Schwarz, Fazendeiro, & Reber, 2003).

While such a fluency explanation of fit-effects can account for the current findings and many other findings, it cannot explain the result of a recent study which shows that initially negative stimuli are evaluated even more negatively when individuals experience fit (Idson, Liberman, & Higgins, 2004). These latter results suggest another explanation, namely that fit increases the level of confidence in reactions that decision-makers experience toward a decision-outcome, regardless of whether those reactions happen to be positive or negative (e.g., Avnet & Higgins, 2006). In other words, people feel right about their reaction towards an object rather than about the object itself. The "*feeling of rightness*" might reflect a metacognition that a person's current orientation matches the perceived requirements of the current concerns and situation (Schwarz, 2006). In other words, when situational demands to use a certain strategy, such as an instruction to decide deliberatively, match with people's dispositional preferences or current orientations (e.g., mood states) people have the feeling that everything is going smoothly. This might result in more confidence in their decision, resulting in a more extreme subjective value of the chosen item (see also e.g., Avnet & Higgins, 2006).

Finally, value-from-fit-effects have been exclusively studied by comparing fit with non-fit conditions. The absence of control conditions precludes any conclusion whether value-from-fit is due to (1) the positive effects of fit or (2) the negative effects of non-fit, or (3) both. Interestingly, in describing the effects most researchers seem to prefer the first option. However, we think it is worthwhile to consider the possible importance of non-fit. Non-fit can be framed as the conflict between ongoing information processing (e.g., either temporarily induced or dispositional) and situational demands (e.g., an instruction to use the opposite processing style). In literature on conflict monitoring it is argued that whenever two cognitive processes conflict, cognitive control

is recruited (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Botvinick, Cohen, & Carter, 2004). The recruitment of control alters the ongoing cognitive processes and may decrease reliance on subsequent responses. As a consequence, in cases of conflict, people may attach lower value to chosen alternatives. Future studies, including control conditions may reveal whether the 'action' is indeed in non-fit. Another way to potentially reveal the mechanisms behind fit and non-fit would be to use social neuroscience paradigms. Interestingly, research on conflict monitoring has shown the critical importance of activation of the Anterior Cingulate Cortext (ACC), when people have to overcome their automatic responses, or natural tendencies (see Botvinick et al., 2004). Also, activation of the ACC has been linked with a drop in reward value (Bush et al., 2002). Therefore, it seems worthwhile to approach fit-effects in future studies from a conflict monitoring perspective.

Fit and the quality and complexity of decisions

Our results raise the question whether fitting decisions are better decisions than non-fitting decisions. While we have shown that people may subjectively value their decision-outcomes higher when they decide in a mood-compatible way, it is unclear whether and how fit could affect the objective quality of decision-outcomes. In future research, several hypotheses with regard to fit and objective quality could be studied. For example, when fit enhances reward value, people may become reluctant to change to other decision alternatives, even when these are objectively better. Moreover, it would be interesting to test the idea that fit would increase the objective quality of decision-outcomes because it increases the quality of information-processing. For example, happy mood individuals may outperform negative mood individuals when asked to base decisions on intuition, and negative mood individuals may perform better when asked to decide based on deliberation. The answer to the question whether fit also enhances the objective value of decision-outcomes seems to depend on whether the decision task requires a specific strategy.

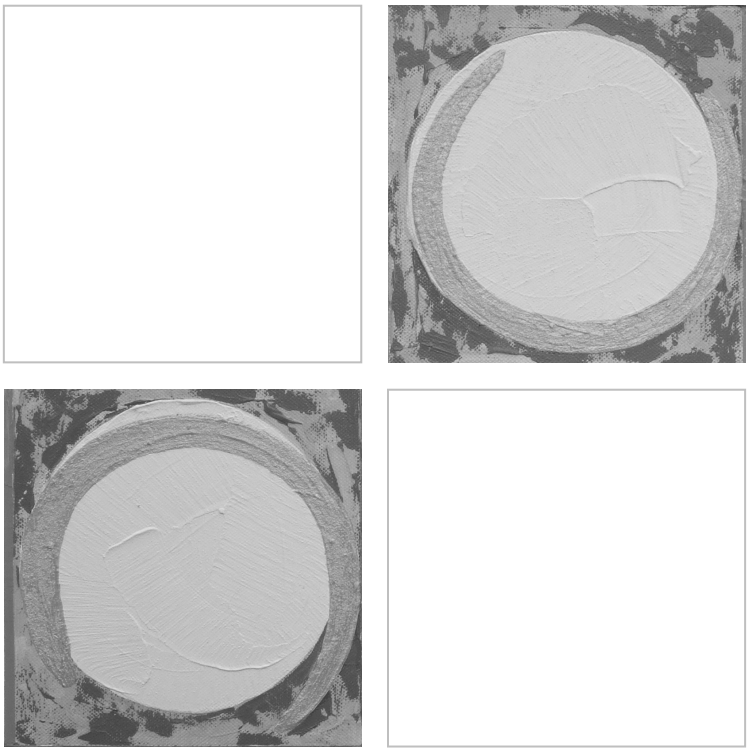
An issue that we believe is worth further exploration is the extent to which our finding would generalize to more complex or important decisions. Interestingly, complexity or importance might not necessarily mean that thoughtful deliberation is a better strategy than reliance on intuition (e.g., Dijksterhuis, 2004; Wilson, 2002). It is important to note that even with relatively simple decision-tasks, such as choosing which thermos to buy, what drink to order or what clothes to wear today, fit-effects between our mood states and the decision-strategies we

apply might have a considerable effect on our daily lives, simply because we make an enormous amount of such decisions every day.

Chapter 5

When You Are Happy, Prototypes Are Just Average

EMG and Self-Report Evidence that Positive Mood Eliminates Preferences for Highly Familiar Prototypes



Based on:

De Vries, M., Holland, R. W., Chenier, T., Starr, M. J., & Winkielman, P. (2008). When you are happy, prototypes are just average: EMG and self-report evidence that positive mood eliminates preferences for highly familiar prototypes.

Abstract

People tend to prefer prototypical stimuli over less prototypical ones – an effect presumably reflecting affective reactions to familiarity. The positivity of prototypes might depend on the extent to which individuals are tuned towards safety concerns. Tuning accounts of mood hold that mood serves as a conditioned signal for environmental safety and automatically tunes information processing and reactions to external objects so that they best serve the individual in the type of context it signals. As expected, we show that compared to a sad mood, a happy mood decreases the positive hedonic value of prototypes - as reflected in self-reported liking judgments as well as "smiling" activity measured with facial electromyography (EMG) - without decreasing the actual familiarity of prototypes. We conclude that mood changes the hedonic implications of the familiarity cue of prototypes. Only in a sad mood, people prefer prototypicality. In a happy mood prototypes are just average.

Key words: Mood, Familiarity, Fluency, Facial EMG, Liking, Prototypes

Introduction

Why do we like certain persons or objects in our environment and dislike others? One of the most robust and well-known determinants of preference is high prototypicality - a phenomenon referred to as the *beauty-in-averages* effect (for a review see e.g., Halberstadt & Rhodes, 2003). This effect occurs with a variety of stimuli, including faces, dogs, abstract patterns, watches and other everyday objects and with a variety of dependent measures, including preference judgments, liking ratings, and psychophysiological responses (e.g., Langlois & Roggman, 1990, Halberstadt & Rhodes, 2000; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006).

The beauty-in-averages effect is considered to reflect a more general tendency to prefer stimuli that are fluent (i.e., processed with relatively high speed and efficiency) and familiar (e.g., Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Fluency and familiarity can stem from being merely exposed to a stimulus, as demonstrated repeatedly in the research on the mere-exposure effect (Zajonc, 1968; Whittlesea & Price, 2001). However, prototypicality can be an even more powerful source of fluency and familiarity. This is because average stimuli (prototypes) resemble each individual exemplar we have seen before. For example, after you have met several of the "children," their "parent" you have never met before can still appear highly familiar. This phenomenon was repeatedly demonstrated with a variety of stimuli ranging from random dots (Posner & Keele, 1968) to words (Deese, 1959; Roediger & McDermott, 1995).

Prototypicality, positivity, fluency, and familiarity

Despite the robustness of the effect, debate is still going on about its theoretical explanation. Several accounts see it as a reflection of low-level biological mechanisms. Some researchers propose that humans have a biological predisposition to interpret prototypicality as a cue to mate value (Symons, 1979). For example, facial, as well as bodily, prototypicality may be predictive of current or prior health, lending individuals with a prototypicality preference a reproductive advantage (Thornhill & Gangestad, 1993). Other researchers view this effect as deriving from inherent positivity of familiarity. One of the reasons for the hyper-familiarity of prototypicality is its fluency (Whittlesea, 2002). Consistent with this idea, Winkielman and colleagues (2006) have shown that prototypes were especially fluent, and especially liked, and that a significant proportion of liking for fluent prototypes was explained by their fluency. Further, not only did people rate prototypical stimuli as attractive, they also showed more positive genuinely affective reactions to prototypical stimuli, as was reflected in facial EMG

measurements (Winkielman et al., 2006). Zajonc (2001) argued that the mere exposure effect, presumably extensible to the prototypicality effect, can be considered as a form of conditioning in which the absence of negative consequences during previous exposure to a stimulus triggers positive affect which becomes linked to the stimulus.

In contrast to the above accounts, which see the link between prototypicality and liking as relatively fixed, other accounts see this link as context dependent. Several authors have pointed out that familiarity is a cue to safety (e.g., Bornstein, 1989; see also Lee, 2001). Thus, as with any cue, its hedonic implications may change as a function of context. Similarly, the connection between fluency and positivity is presumably based on the heuristic value of the cue in a particular environment (Gigerenzer, 2008). We reasoned that the link between prototypicality and positive hedonic value might depend on the extent to which individuals are tuned towards safety concerns.

Tuning models of mood hold that an individual's mood state serves as a conditioned signal for environmental safety or danger and automatically tunes information processing and reactions to external objects so that they best serve the individual in the type of context it signals (Clore, Schwarz, & Conway, 1994; Schwarz, 2002). According to these accounts, a sad mood state signals a problematic and potentially dangerous environment, tuning individuals towards safety concerns. Conversely, a happy mood signals benign environments, making safety concerns less central to happy individuals than to sad individuals.

In the current research, we test whether mood changes the hedonic value of prototypicality. Most research on the preference for prototypes relies on self-reported liking or attractiveness ratings. The problem with such ratings is that it is unclear whether such ratings reflect genuine affective reactions to stimuli, or "cold" judgments of stimulus quality, which are driven by different processes. Genuine affective reactions occur early and are based on priming. In contrast, judgments occur later, they are more deliberative and reflect more strategic recollection (cf. e.g., Whittlesea, 2002). Therefore, it is important to rely on measurements that have the potential to capture the early, genuine affective reactions. Psychophysiological measurements, such as facial EMG, have this potential (e.g., Cacioppo, Petty, Losch, & Kim, 1986; Winkielman & Cacioppo, 2001).

Positive affective reactions manifest themselves in greater activity in the cheek muscle for smiling, the zygomaticus major, whereas negative affective reactions manifest themselves in greater activity in the frowning muscle above the eyebrow, the corrugator supercilii. Corrugator

effects are more sensitive to the tonic (prolonged, resting) states, whereas zygomaticus effects reflect more phasic reactions (cf. e.g., Winkielman & Cacioppo, 2001). Previous research (e.g., Harmon-Jones & Allen, 2001; Winkielman & Cacioppo, 2001; Winkielman et al., 2006) demonstrated that facial EMG can successfully detect affective responses. These studies consistently showed increased EMG activity over the cheek, but not the brow region for merely exposed, fluently processed, and prototypical stimuli.

We expected that mood would moderate the robust preference for prototypicality. We hypothesized that, compared to a sad mood, a happy mood would result in a decrease in the positive hedonic value of prototypes as reflected in self reported liking judgments as well as "smiling" activity (Study 5.1), without decreasing the actual familiarity of prototypes (Study 5.2). That is, we expected prototypes to be hyper-familiar (Whittlesea, 2002), with the hedonic implications of this familiarity cue changing as a function of mood.

Study 5.1

We aimed to test the expected differential impact of incidental happy versus sad mood states on affective reactions towards prototypes, in a paradigm recently used in a demonstration of genuine affective preference for prototypes (Winkielman et al., 2006, Study 3). After a mood manipulation, participants were exposed to mathematical distortions of random-dot-pattern prototypes (Posner & Keele, 1968). Usage of abstract stimuli (random dots) minimizes problems inherent to the usage of meaningful stimuli, such as symmetry or prior experience (Rhodes, Sumich, & Byatt, 1999).

Specifically, participants were exposed to converging distortions (i.e. "seen distortions") of a prototype. The fifteenth distortion (i.e., "unseen distortion") and the prototype were never shown during the exposure phase. During the subsequent test phase, participants provided liking ratings for each of the following six test patterns: seen distortion, unseen distortion and prototype of the prepared category (during the exposure phase) and their controls from an unprepared (i.e. unexposed) category of dot patterns. Moreover, we used facial EMG to measure mood impacts on spontaneous affective reactions towards those stimuli. We predicted that individuals in a negative mood state would show a stronger preference in liking and spontaneous affective reactions for the prepared (compared to the unprepared) prototype than individuals in a positive mood state.

Moreover, the paradigm we used provided us with the opportunity to test the effect of single prior exposure of converging distortions of a prototype (i.e., "seen distortions") on affective reactions and liking judgments to distortions. We only expected judgmental effects for distortions. Whereas exposure effects on genuine affective reactions usually require repeated exposure, judgments reflect more strategic processing (Harmon-Jones & Allen, 2001; Whittlesea, 2002; Winkielman et al., 2006; Zajonc, 1968).

Method

We randomly assigned 16 students from the University of California, San Diego, who participated for course credits, to either a happy or a sad mood condition. Upon arrival, participants were fitted with EMG electrodes and resting EMG to determine participants' pre-experimental baseline was measured. Next, we manipulated participants' mood state by instructing them to focus on and describe a happy versus sad autobiographical memory (e.g., Levine, Wyer, & Schwarz, 1994; Schwarz & Clore, 1983). Then, we checked mood state with a 7-pointscale question ("How do you feel right now?"), anchored with "very negative" and "very positive." To maintain the induced mood state, participants subsequently started listening to music previously used to successfully induce either a happy or a sad mood state, including *Eine Kleine Nacht Musik* by Mozart and *Adagietto* by Mahler (Storbeck & Clore, 2005; Niedenthal & Setterlund, 1994). We also measured participants' post-mood-manipulation EMG activity, which served as a physiological mood check.

The successive dots task consisted of ten randomly ordered cycles of exposure (preparation) and testing (of prepared and control categories; counterbalanced between participants). During exposure, distortions were presented in the middle of the screen for 1000 ms with a 400 ms inter-stimulus interval. Participants were instructed to concentrate on each study pattern because they would later be asked to make various judgments about these patterns. During the test phase, dot patterns were presented in random order. Each trial was preceded by a blank screen (for 1000 ms), followed by a fixation point in the middle of the screen (for 1000 ms). The test pattern was presented for 1500 ms, followed by a "*" (for EMG measurement purposes) in the middle of the screen (for 4000 ms). After this, participants were asked: "How much do you like this pattern?", on a scale from 1 to 9 (self-paced).

EMG Recording and Data Reduction. EMG recording and data-processing steps followed psychophysiological standards of Fridlund and Cacioppo (1986). Impedance was reduced to below 15 KΩ at those spots in the face (left cheek and eyebrow) where the 4 mm Ag/AgCl

surface electrodes would be placed. Smiling was assessed by the activity over the region of zygomaticus major (cheek) and frowning was assessed by the activity over the region of corrugator supercilii (eyebrow). Signals were acquired with BIOPAC MP150 equipment, sampled at 2000 Hz, with gain set to 2000, and filtered with a 5 kHz to 1 Hz band pass. Acquisition was controlled by BIOPAC's AcqKnowledge software version 3.81, and further processing was performed with Mindware Corporation software. The signals were filtered from 10 to 500 Hz, rectified, and integrated. The data were then standardized (converted to z-scores) within participants and muscles. Outliers were range corrected with values of +/- 3 SD. Finally, activity within 100 milliseconds intervals was calculated.

Next, we calculated two measures of EMG activity. First, we calculated the measure of impact of the mood manipulation on participants' background state. Specifically, we took the activity of facial muscles during 10 second of rest activity right after the mood induction. This activity was baseline-corrected by corresponding values in the 10-second rest period before the mood induction, and standardized (converted to z-scores) by participant and muscle. Second, we calculated the EMG activity in reaction to the presentation of different dot patterns (test – control). We calculated a baseline for each stimulus, defined as the activity during the last 900 ms in the pre-stimulus period. This period was selected because it was free of artefacts reflecting the orienting reaction to the onset of the new trial. Then, we calculated baseline-corrected activity to the presentation of test dot patterns in 1-second intervals.

Results and Discussion

Mood manipulation check. Participants indeed reported significantly more positive mood states in the happy (M = 5.50) than in the sad (M = 3.75) mood condition, $t(14) = 2.82$, $p < .01$, *Cohen's d* = 1.51. Moreover, a mixed model ANOVA with Mood (happy vs. sad), Muscle (zygomaticus vs. corrugator), Time (10 seconds), and Gender (male vs. female) revealed a 3-way Muscle*Mood*Time interaction, $F(9,108) = 2.29$, $p < .03$, $\eta_p^2 = .16$. Mood effects were particularly pronounced in the later 5 seconds, especially for the sad mood. Specifically, in the sad mood, the corrugator activity was significantly greater than zygomaticus activity, $t(7), = 3.63$, $p < .01$, $d = 1.36$, whereas in the happy mood, there was no significant difference. In short, the mood manipulation was successful on both self-report and physiological measures, with tonic (as opposed to phasic) effects of sad mood especially notable on the corrugator.

Main analyses. To assess the effects of prototype preparation on smiling we conducted a 3 Stimulus Type (prototype vs. seen distortion vs. unseen distortion) x 5 Time (first trough fifth

second after stimulus onset) x 2 Mood (happy vs. sad) mixed model ANOVA revealed a significant 3-way Mood*Stimulus*Time interaction for cheek activity, $F(8,112) = 2.10$, $p < .05$, $\eta_p^2 = .13$. As illustrated in Figure 5.1, the difference in zygomaticus activity for the prepared versus the unprepared prototypes is significantly bigger for individuals in the sad versus happy mood condition as early as two second after stimulus onset, peaks at the fourth second and then disappears by second five. As expected, no prototypicality effects were obtained for frowning.

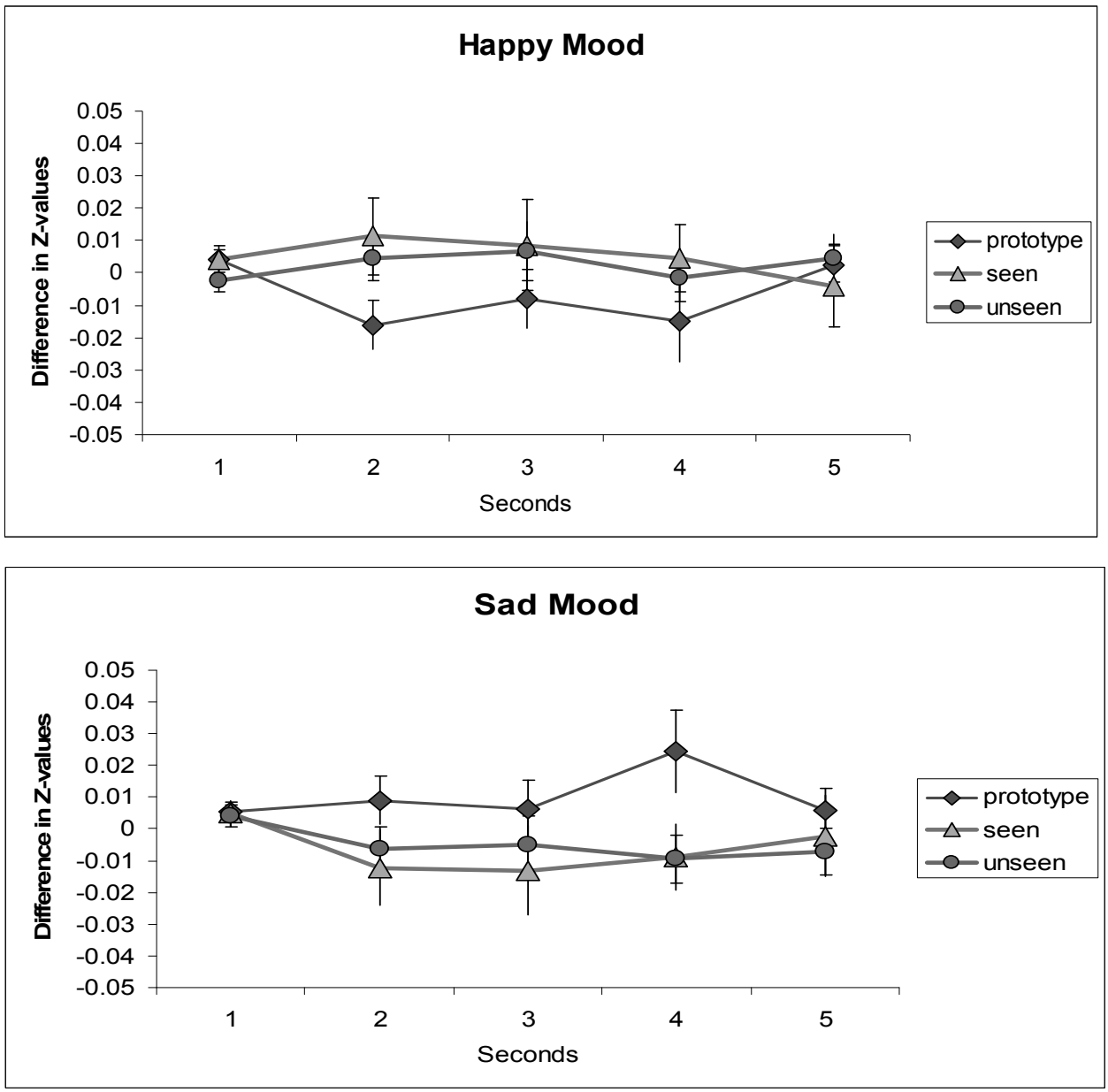


Figure 5.1. Means and standard errors of EMG activity (zygomaticus major) as a function of stimulus type (prototype, seen distortion and unseen distortion) for a happy and sad mood state.

We also observed differences in liking judgments of old category versus new category stimuli as a function of mood. A 3 Stimulus Type (prototype vs. seen distortion vs. unseen distortion) x 2 Mood (happy vs. sad) mixed model ANOVA revealed a significant main effect of mood on liking differences, $F(1,14) = 8.15$, $p < .02$, $\eta_p^2 = .37$. As illustrated in Figure 5.2, the difference in liking for stimuli from the old versus new category of dot patterns was bigger in the sad than in the happy mood condition. Moreover, in the sad mood, but not in the happy mood condition ($t < 1$), people like the old prototype more than the new prototype, $t(7) = 3.11$, $p < .02$.

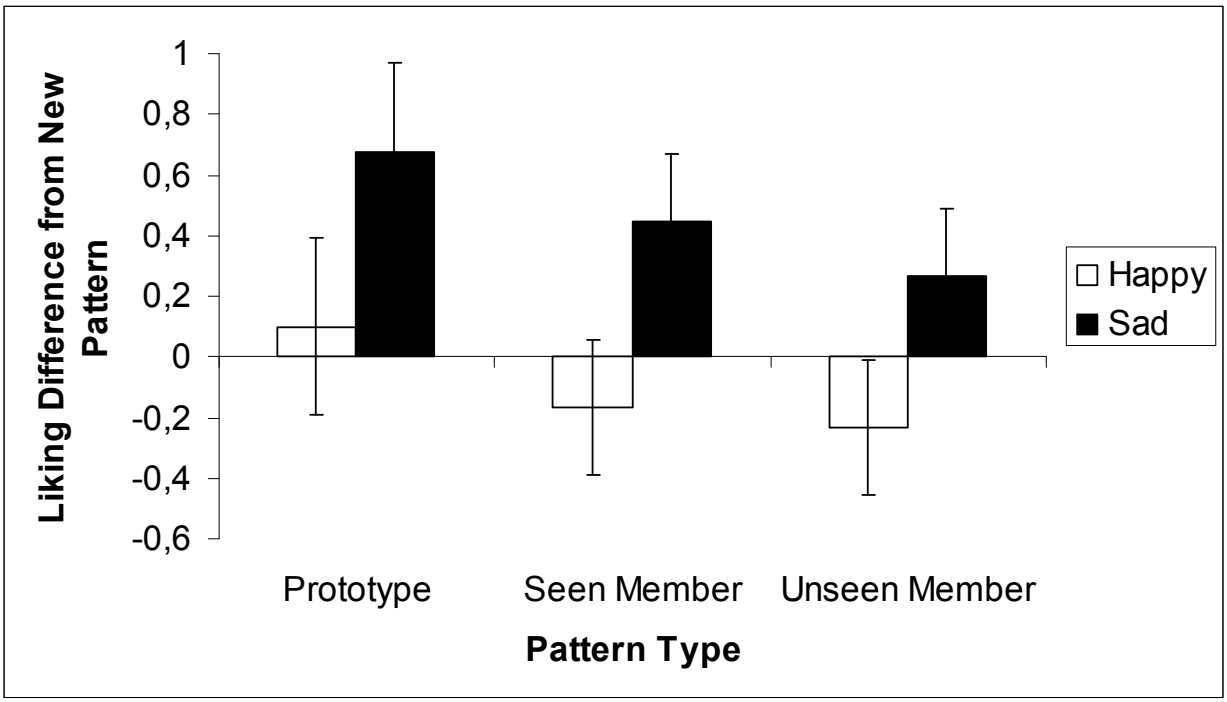


Figure 5.2. Means and standard errors of liking judgments as a function of stimulus type (prototype, seen distortion and unseen distortion) and of mood state (happy versus sad).

In sum, the results form Study 5.1 showed that in a sad, but not in a happy mood, people prefer the prepared prototypes. These elicited more "smiling" and more favorable judgments than their controls, the unprepared prototypes. These results are in line with our hypothesis that the hedonic value of the familiarity cue of prototypicality only elicits genuine positive affective responses in a mood state tuned towards safety concerns (i.e., a sad mood state), but not in a mood state tuned towards exploration (i.e., a happy mood state).

Study 5.2

Study 5.2 served two main objectives. First, we aimed to test our assumption that prototypical dot-patterns, prepared by exposure to converging distortions, were indeed familiar. That is, we expected to obtain a false memory effect (Roediger & McDermott, 1995; see Roediger, Watson, McDermott, & Gallo, 2001, for a review) for prepared but not previously shown prototypes. Second, if the decrease in preference for prototypicality in a happy mood state observed in Study 5.1 is indeed due to mood changing the value of the familiarity cue of prototypes rather than familiarity itself, false memory for prototypes should be present in both the happy and the sad mood condition.

Method

Twenty students from the University of California, San Diego, participated for extra credit. They were randomly assigned to either a sad or a happy mood condition. First, we manipulated mood, using the same music as in Study 5.1, which also has previously been used to successfully induce either a happy or a sad mood state (e.g., Storbeck & Clore, 2005; Niedenthal & Setterlund, 1994). During the subsequent dots task, participants now gave memory ratings (confidence of recall on a 7-pointscale).

Results and Discussion

As expected, items from old, prepared categories of dot patterns were more familiar than items from new, unprepared categories. For each stimulus type (i.e., prototype, seen distortion, and unseen distortion) the difference in memory between prepared and unprepared items was greater than 0 and this held true for both moods (all one sample t-tests $p < .01$), see Figure 5.3. A 3 Stimulus Type (prototype vs. seen distortion vs. unseen distortion) x 2 Mood (happy vs. sad) mixed model ANOVA revealed a significant main effect of Stimulus Type on memory ratings, $F(2,36) = 7.48$, $p < .01$, $\eta_p^2 = .29$. Contrasts showed that seen distortions were more familiar than unseen distortions, $F(1,18) = 20.79$, $p < .01$, $\eta_p^2 = .54$, and crucially, the difference between the two unseen items, that is prototype and unseen distortion, was significant too, $F(1,18) = 7.67$, $p < .02$, $\eta_p^2 = .30$. Memory ratings for the "prepared" but unseen prototype did not differ from memory ratings for the seen distortion, $F < 1$, see Figure 5.3. So, we found a strong replication of the false memory effect for prototypes, using abstract stimuli (i.e., random dots; cf. e.g., Roediger & McDermott, 1995; for review see Roediger, Watson, McDermott, & Gallo, 2001).

Comparisons of confidence judgments to individual items in different mood states revealed that the difference between prototype and unseen distortion is significant in the positive mood condition, $t(9) = 2.31$, $p < .05$. However, in the negative mood condition, this difference was no longer significant ($t < 1$). That is, in a positive mood "false memory" for prototypes is greater than false memory for unseen items, but in a negative mood it is the same. Similarly, participants randomly assigned to the happy mood conditions differed more in their confidence ratings for recognition of the prototype of the old versus new category than participants randomly assigned to the sad mood condition, $t(18) = 1.51$, $p < .08$. So, prototypes were indeed familiar and this familiarity did not decrease in a happy mood state. If anything, a happy mood state increased the familiarity of unseen but prepared prototypes.

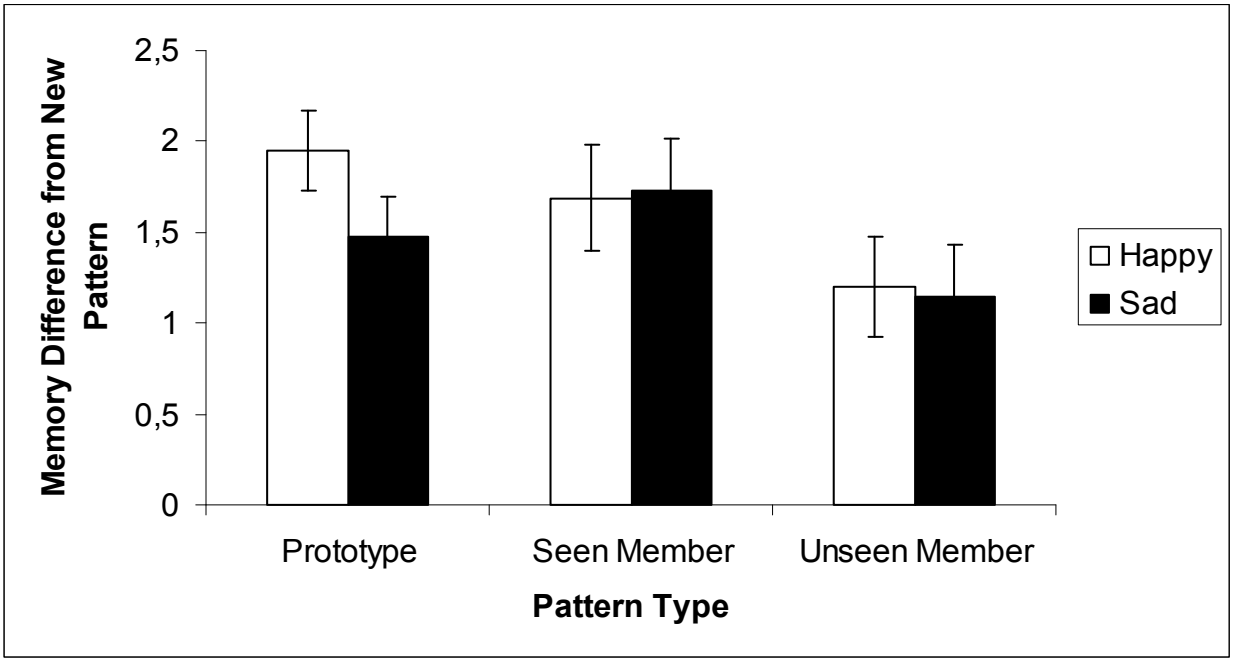


Figure 5.3. Means and standard errors of memory judgments as a function of stimulus type (prototype, seen distortion and unseen distortion) and of mood state (happy versus sad).

General Discussion

In the current research, we aimed to test the impact of incidental mood states on the positivity of prototypicality. Our results provide evidence for the idea that this robust and presumed general tendency to prefer prototypical stimuli depends on mood. Only in a sad mood state, people prefer

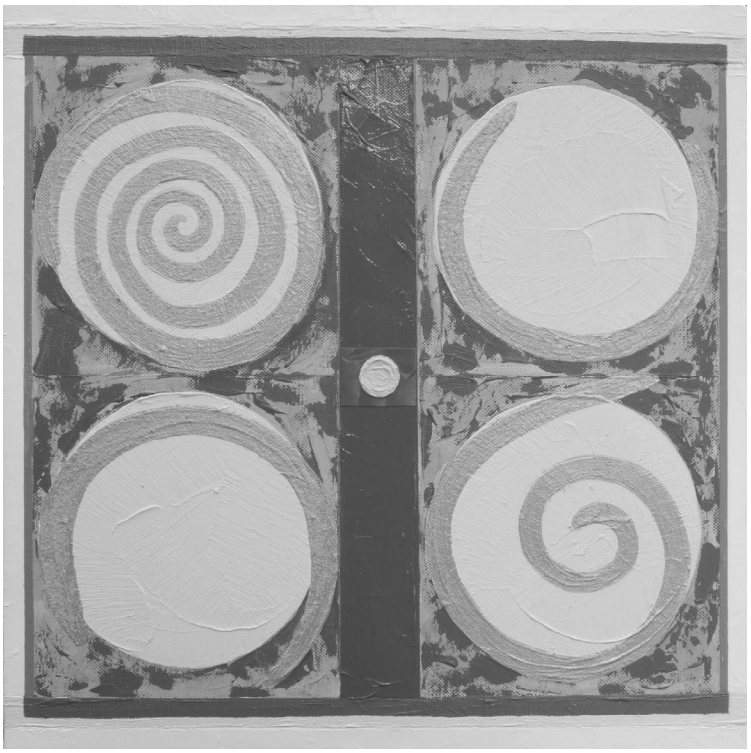
prototypicality. To the best of our knowledge, this study is the first study to show that the positivity of prototypicality measured as liking judgments changes as a function of mood. Moreover, convergent with the evidence on self-reported liking for prototypical stimuli, the current results show that mood impacts genuine positive affective reactions towards prototypical stimuli. We provide EMG evidence that only in a sad, but not in a happy mood state, prototypical stimuli increase activity in the "smiling" muscle. In other words, we have shown that prototypical stimuli can put a smile on a sad face. Importantly, prototypes appear at least as familiar in a happy as in a sad mood state, but in a happy mood, individuals just do not "care" about familiarity.

The current findings appear to have important implications for the understanding of the positivity of prototypicality. The observed mood impact on hedonic reactions towards prototypicality suggests that the hedonic value of familiarity depends on the importance of its safety connotations for the individual in its current context. Mood states appear to tune affective responses towards prototypical stimuli. If an individual's mood state signals a problematic environment, safety concerns become central to the individual, with spontaneous positive affective reactions towards familiar stimuli as a result. These results appear to corroborate the more general notion of the goal-dependency of spontaneous affective reactions towards objects in our environment (e.g., Ferguson & Bargh, 2004) and more specifically, the idea that the hedonic implications of heuristic cues are context-dependent (e.g., Gigerenzer, 2008). Consistent with this idea, another recent investigation provided evidence for enhanced liking of fluently processed stimuli in a prevention compared to a promotion focus (Freitas, Azizian, Travers, & Berry, 2005). However, those results did not clarify whether it was the hedonic implication of fluency, or fluency itself, which was context-dependent. We provide clear evidence for mood impact on the hedonic implications of familiarity. Moreover, without physiological measurement, it is unclear whether individuals merely give higher ratings to stimuli, or actually feel better.

To conclude, our findings show the context-dependency of the hedonic value of familiarity of prototypicality and suggest that only in a sad mood state people are attracted to prototypicality and familiarity. In contrast, in a happy mood state, people do not put extra value on this.

Chapter 6

General Discussion



When making a decision, we can rely on intuition as well as deliberation. In this dissertation, our primary goal has been to advance our understanding of the impact of mood states on intuitive versus deliberative judgment and decision making. Our proposal has been that the mood state of decision makers is an important influence on the reliance on affective reactions and logical analysis, or sense and sensibility. The preceding empirical chapters provided a detailed view of this issue. In this final chapter, I will adopt a broader view. I will consider the key empirical findings from the previous chapters and integrate these by providing an explanation of how they relate to the core questions of this dissertation. I will also discuss theoretical and practical implications of the empirical findings and suggest potential directions for future research.

A review of the key findings

This dissertation served two main objectives. The first aim was to test whether mood states influence the reliance on gut feelings versus analytical reasoning in judgment and decision making. The second aim was to gain more insight in the underlying mechanism by which mood impacts intuitive versus deliberative decision making. We suggested a tuning account and tested this with a focus on the fit between mood states and intuitive versus deliberative decision strategies and on the impact of mood on the human tendency to prefer prototypical stimuli.

Mood and reliance on gut feelings and analytical logic

First of all, we tested our expectation that mood affects the tendency to rely on gut feelings in decision making. In line with our expectation, our studies showed that compared to a sad mood state, a happy mood state appeared to result in stronger reliance on gut feelings. In Chapter 2, we used a task commonly used to test intuitive decision making in laboratory settings: the Iowa gambling task. We investigated the role of naturally occurring (Study 2.1) as well as experimentally induced (Studies 2.2 and 2.3) mood states in intuitive decision making. After we measured or manipulated their mood state, participants performed the Iowa gambling task. We indeed found that in the intuitive part of the Iowa gambling task, a happy mood was the winning mood.

Our notion that a happy mood imposes an inclination on decision makers to rely on intuition was taken a step further in Chapter 4. Here, we reasoned that if a happy mood indeed imposes a tendency on decision makers to use intuition, then a match between a decision maker's mood state and the applied decision strategy is likely to be beneficial, that is, to result in a fit

effect. Previous research showed that a fit between a decision strategy and the focus of an individual increases the subjective value of decision outcomes compared to a non-fit or mismatch (e.g., Higgins et al., 2003). In an experiment manipulating both mood states and decision strategies, we indeed found that decision makers in a happy mood valued their chosen outcomes more after making an intuitive than after making a deliberative decision, suggesting that a happy mood indeed imposes a tendency on decision makers to rely on intuition rather than deliberation.

Second, we tested our expectation associated with the complementary part of our first main objective. That is, we investigated whether a sad mood state imposes a tendency on decision makers to rely on deliberation. We expected that sad decision makers would outperform happy decision makers in logical, rule-based decision making. This expectation was tested in Chapter 3. After a mood manipulation, participants made investment decisions (Study 3.1) or gambling decisions (Study 3.2) in tasks that require decision makers to follow a logical rule to maximize expected profit. The results of Chapter 3 support the idea that in a sad mood state, decision makers more strongly base their decisions on logical rules.

Again, we found additional support for this complementary part of our idea that the mood state of decision makers impacts their tendency to rely on intuition versus deliberation in Chapter 4. Analogously, we reasoned that if a sad mood indeed imposes a tendency on decision makers to use deliberation, then it is likely to fit with decision making based on a careful analysis of the pros and cons of various decision options rather than based on gut feeling. This is indeed what we found. Decision makers in a sad mood valued their chosen outcomes more after making a deliberative than after making an intuitive decision. This research also provides the first empirical evidence for a fit effect as a function of mood.

In sum, in line with our expectations, happy decision makers indeed outperformed sad decision makers in intuitive decision tasks and sad decision makers outperformed happy decision makers in rule-based decision tasks. Together, these results indicate that happy versus sad mood states moderate reliance on affect versus logical reasoning in decision making. Moreover, we found that decision makers assigned a higher value to their decision outcome after making fitting (i.e., an intuitive decision in a happy mood or a deliberative decision in a sad mood) than after making non-fitting decisions. Previous research has so far neglected the potential influence of mood state on reliance on affective reactions versus logical analysis in judgment and decision making. This is surprising, given the prominent role of this distinction in the psychological literature. Whether individuals rely on intuition or on deliberation can have a significant impact

on their judgments and decision outcomes, with potentially far-reaching consequences for the well-being of affected persons. Taken together, the empirical findings discussed so far show that happy versus sad mood states appear to impose a tendency on decision makers to rely on deliberation or intuition.

Moody tunes: Tuning in to deliberation and intuition

Our second main objective was to further our understanding of the underlying mechanism by which mood impacts intuitive versus deliberative decision making. We suggested a tuning account for how mood states influence judgment and decision making. Specifically, based on the notion of situated cognition (e.g., Clore et al., 1994; Schwarz, 2002), we proposed that mood might function as a conditioned stimulus for the state of the situation individuals are in and might automatically tune cognition and emotion so that they best serve individuals in the type of context signaled by their mood states. We noted that the type of situation signaled by mood does not necessarily correspond to the actual state of the environment, since our mood states often spill over from one situation into another. In sum, according to our notion of the tuning function of mood, a state of happiness imposes a tendency on decision makers to rely on intuition whereas a state of somberness imposes a tendency on them to rely on deliberation.

The empirical findings of this dissertation discussed so far are in line with the idea of a tuning function of mood in judgment and decision making. Nevertheless, alternative theoretical accounts are possible. The use of intuition rather than deliberation in a happy mood state might stem from deficits in processing capacity (e.g., Isen et al., 1982; 1987; Mackie & Worth, 1989; 1991) or in motivation (e.g., Schwarz, 1990; Wegener & Petty, 1994). That is, in a happy mood state, decision makers might simply not have enough cognitive capacity available for careful deliberation, or they might lack the drive to engage in thorough deliberation before making a decision.

However, in the empirical chapter on the fit between mood states and decision strategies (Chapter 4), we observed no difference in the time it took to make a deliberative decision for decision makers in either a happy or a sad mood state. This finding is contrary to capacity or motivation accounts of mood impacts. That is, if a happy mood would restrain processing capacity, one would expect that making a deliberative decision would take longer in a happy mood than in a sad mood state. And if a happy mood would reduce the motivation to engage in thorough deliberation, one would expect that decision makers in a happy mood state would devote less time to making a deliberative decision than decision makers in a sad mood state. This

does not rule out that a happy mood state might have decreased both processing capacity (which would increase decision time) and motivation (which would decrease decision time) to the same extent, with the opposite impacts on decision time cancelling each other out, but is does seem to render capacity and motivation accounts less likely.

The results of mood impacts on the preference for prototypicality in the final empirical chapter provide even stronger support for a tuning explanation. In Chapter 5, we investigated the impact of mood on the general tendency for people to prefer prototypicality. Our expectation was that this preference would vary as a function of an individual's mood state. The preference for prototypical over less prototypical stimuli, as measured by liking judgments as well as by spontaneous positive affective reactions, was indeed stronger in a sad than in a happy mood state. Only in a sad mood state people prefer prototypicality (Study 5.1). We showed that this mood effect on the preference for prototypicality is not due to an increase in familiarity of prototypes in a sad mood state (Study 5.2). If anything, prototypes become more familiar in a happy mood state, but in a happy mood, people just do not seem to care about familiarity. We conclude that mood appears to change the hedonic implications of the familiarity cue of prototypes. This research not only provides the first empirical evidence for the context-dependency of the positivity of prototypes, it also provides support for a tuning account of mood impacts on information processing.

While capacity and motivation models of mood impacts on information processing do not provide a plausible account for these results, a tuning model does: The hedonic implications of the familiarity cue typical for prototypes differ as a function of mood because these implications depend on the extent to which individuals are tuned towards safety concerns. A sad mood state signals a problematic and potentially dangerous environment, and automatic tuning towards safety concerns is exactly what a sad mood does. In a happy mood, the familiarity of prototypes does not increase their hedonic value. In other words, a sad mood makes us prefer prototypicality, whereas in a happy mood, prototypes are just familiar. Taken together, the results of the current dissertation support the idea that happy versus sad mood states tune in to deliberation and intuition respectively in judgment and decision making.

Implications:
Mood matters in judgment and decision making

Based on the results presented in this dissertation, we conclude that mood matters in intuitive versus deliberative judgment and decision making. The effects we observed in our studies have some important implications. Firstly, the results presented here have theoretical implications for our understanding of the role of mood in intuitive and deliberative decision making. Secondly, they have practical implications for the decisions we all make in our daily lives.

Tuning in: Imposing a tendency on decision makers

An interesting question is whether people always use their affective reactions as a basis for judgment and decision making when they are in a happy mood and always base their judgments and decisions on a thorough, logical analysis of the relevant information when they are in a sad mood state. Our notion of the tuning function of mood is that mood states "prepare" decision makers to rely on intuition or deliberation. Tuning effects of mood can be overridden by other factors, such as an individual's goal, or situational demands (e.g., Schwarz, 2002; see also e.g., Bless et al., 1996; Fiske & Neuberg, 1990). This dissertation indeed shows that decision makers in a happy mood state appear to be able to deliberate and that decision makers in a sad mood state appear to be able to use intuition (Chapter 4). Previous research on mood impacts on affective priming showed that individuals in a sad mood appeared cautious to rely on their first affective responses. That is, they did respond in line with a primed affective reaction, but they were slower in responding than individuals in a happy mood state (Hermsen et al., 2008).

Moreover, mood impacts on the use of intuition versus deliberation might depend on the availability of affective and analytical sources of information. If the only source of information that is available is a logical rule, individuals in a happy mood state might also use this logical rule as input for their judgments and decisions. And in a similar vein, if there is nothing else to rely on, even decision makers in a sad mood state might rely on their feelings. Individuals can probably overcome their mood-imposed tendency to rely on deliberation or intuition if analytical or affective sources (respectively) are unavailable. We are currently investigating these ideas and we found some preliminary supportive evidence (De Vries, Holland, & Witteman, 2008c). That is, after conditioning products with affect-laden pictures (positive, negative or neutral), choices as well as self-reported liking and wanting reflected the conditioned affective associations in a

happy as well as a sad mood condition. With only the affective source of information available, individuals in both happy and sad mood states used this as a basis for choices and judgments.

Rules in decision making

The current findings also seem to have important implications for our understanding of mood impacts on the extent to which individuals rely on rules in decision making. It is important to clarify mood impacts on rule-based decision making. There are two types of rules: rules of thumb, or heuristics, and logical rules. A happy mood state appears to increase the use of the former, a sad mood state of the latter. For example, previous research showed that in a happy mood, individuals more strongly rely on an activated stereotype (Bodenhausen et al., 1994) and on the ease of retrieval heuristic (Ruder & Bless, 2003). This dissertation has shown that a sad mood appears to increase the use of a simple logical rule. Reliance on heuristic "rules" is a form of simplified processing of information, based on associations and experiences, or System 1 processing, typical for individuals in a happy mood state. In contrast, reliance on logical rules that stem from a careful analysis of the information which is relevant to a judgment or decision task is a form of System 2 processing, typical for individuals in a sad mood state.

Real-life decision making

This dissertation has provided empirical evidence for the role of mood in intuitive versus deliberative decision making. This evidence is based on experimental research in a controlled laboratory setting, which has the advantage that it allows for conclusions about the causal role of mood in intuitive and deliberative judgment and decision making. Mood matters. The kinds of decisions which we investigated include simple decisions with low-impact outcomes. In everyday life, we make many of such decisions. Even if we would only consider mood matters in the almost endless amount of relatively simple, mundane decisions, its impact in our daily lives would be significant. We also used a paradigm that models complex, real-life decision making in an uncertain environment (i.e., the Iowa Gambling task; Damasio, 1994). Therefore, we conclude that the tuning function of mood is likely to be a more general phenomenon, automatically imposing a tendency on decision makers to either rely on intuition or on deliberation, independent of the type of decision they are about to make. The mood impacts on judgment and decision making described in this dissertation appear to allow for the conclusion that mood also matters in real-life decision making.

Whether mood state also affects the quality of our decisions in real-life is another question. If our affective reactions and logical analyses point in different directions, mood-

induced intuitive or deliberative decision strategies can result in different decision outcomes. Which strategy is best seems to depend on many factors, such as the properties of the task (e.g., complexity), the criteria used to judge decision quality (e.g., ethical or economical criteria, and self-benefit or benefit for others), and domain-specific requirements (e.g., Hogarth, 2001; 2005; Dijksterhuis & Nordgren, 2006; Plessner & Czenna, 2008; Tetlock, 2002; Wilson, 2002). As the observed fit effect in the current dissertation illustrates, it also seems important to take the subjective outcome quality into account. Finally, the extra time and effort we can invest in decision making processes in an attempt to maximize the objective outcome quality is not necessarily an investment worth making. Sometimes, maximizing decision outcomes simply does not offset the burdens of a lengthy decision making process. Decision makers need to balance effort and accuracy (e.g., Payne, Bettman, & Johnson, 1993). It appears rational for decision makers in real-life, who only have a limited amount of time and energy available, to "satisfice" rather than maximize their decision outcomes, aiming for what is "good enough", but not necessarily "the best" (e.g., Simon, 1955; 1957; 1983; see also Schwartz, 2004). A positive mood state seems helpful in this, due to the tendency it imposes on decision makers to rely on intuition.

Directions for future research

In this section, we would like to suggest some potential directions for future research to further our understanding of the role of mood, of intuition and deliberation, and of their interplay in judgment and decision making. Moreover, we would like to consider some related issues that might be worthwhile to investigate further.

Fine tuning

Future research could be aimed at further elucidating the tuning mechanism by which mood appears to influence intuitive or deliberative decision making. An intriguing question is whether mood states impact the use of gut feelings, the occurrence of gut feelings (i.e., their onset and strength), or both. It is unclear whether the observed mood impact on intuitive decision making is due to people having stronger gut feelings in a positive mood state than in a negative mood state, or to a stronger reliance on these affective reactions in a happy than in a sombre mood state. While we interpret the impact of mood on intuitive decision making as mood influencing the tendency of decision makers to rely on affective reactions, the observed effect of mood on affective reactions towards prototypical stimuli in Chapter 5 raises the question whether

mood might also have impacted affective reactions towards choice options (i.e., somatic markers) in Chapter 2.

With the use of psychophysiological measurements, such as skin conductance responses (cf. Bechara et al., 1997) or EMG, future research could aim to find an answer to the empirical question whether somatic markers are stronger in a happy mood (e.g., due to individuals in a happy mood being able to integrate large amounts of information better than individuals in a sad mood, cf. Bless et al., 1996; Bruner, 1957; Isen, 1987), in a sad mood (e.g., due to mood impacts on the hedonic implications of riskiness, cf. Chapter 5), or equally strong in both mood conditions. Intriguingly, affective reactions might have been stronger in a sad mood, but still more influential in a happy mood, because of the reluctance to rely on affective cues in a sad compared to a happy mood state (cf. Hermsen et al., 2008). A related question is whether individuals are more able to perform logical analyses when they are sad than when they are cheerful. Our results (Chapter 3) showed no difference in understanding of a logical rule between mood conditions. Rather, in a sad mood individuals appeared to stick to it longer than in a happy mood.

Probably, it is not only mood that matters when it comes to intuitive versus deliberative judgment and decision making. It seems worthwhile to examine other potential factors that might impact the use of intuition versus deliberation. These factors include environmental cues for the safety or danger of a situation (e.g., Schwarz, 2002) and domain-specific requirements, as well as personality factors, such as the abilities, confidence and experience of decision makers, and dispositional preferences for intuitive versus deliberative decision-making (e.g., Epstein et al., 1996; cf. Betsch & Kunz, 2008; De Vries et al., 2008b). Other factors that have been linked to mood states might also impose a tendency on individuals to use intuition or deliberation. These include approach versus avoidance orientations (e.g., Friedman & Förster, 2001), global versus local focus (e.g., Gasper & Clore, 2002), and left versus right hemispheric activation (e.g., Davidson, 1992; Koch, Holland, & Van Knippenberg, in press; Rotenberg, 2004; Satpute & Lieberman, 2006). Finally, it would be interesting to investigate the effects of other affective states than happiness and sadness, such as anger, on the use of intuition versus deliberation in judgment and decision making (cf. e.g., Lerner & Tiedens, 2006; Harmon-Jones, 2004).

Zooming out

Taking a broader perspective, perhaps the most pressing direction for future research is to address the diverse challenges that arise when decisions truly matter because of their impact on

our well-being or on the well-being of others. Challenges may be particularly high in case of for instance medical decisions, which can be irreversible and often have significant implications for patients' well-being. We know from previous research that affect plays an important role in health communications and in the construction of health preferences (e.g., Peters et al., 2006). In a new line of research, we are currently beginning to explore mood impacts on the effectiveness of decision aids for the construction of health preferences (see also Kerstholt, Van der Zwaard, Bart, & Cremers, 2008). Future research also seems essential in domains where affective and intuitive versus deliberative processes seem to be of particular importance, such as in moral, ethical and social judgment and decision making and in other areas where people try to influence or help others in the choices and decisions they make, for example in careers counseling, advertisement, and promotional campaigns by governments or non-profit organizations.

In an endeavour to improve decision quality and contentment, an important question for future research is when intuition beats deliberation, and vice versa. Several attempts have been made to answer this question (e.g., Hogarth, 2001; 2005; Dijksterhuis & Nordgren, 2006; Dijksterhuis et al., 2006; Plessner & Czenna, 2008; Wilson, 2002; Wilson & Schooler, 1991). These attempts highlight a number of aspects which appear to be of importance, including characteristics of the environment (e.g., the presence and nature of feedback), of the decision task (i.e., complexity in terms of amount of information involved), of the decision maker (e.g., quality of implicit and explicit knowledge), and interactions between those factors. For instance, some recent studies suggest that intuitions stemming from unconscious thought might be especially important in complex decision tasks, when our deliberative, cognitive resources are not always sufficient (e.g., Dijksterhuis, 2004; Dijksterhuis et al., 2006; see also Nørretranders, 1998; Wilson, 2002). It seems important to take this a step further and to investigate whether happy versus sad mood states might help to improve decision quality when either intuition or deliberation appears to be the best decision strategy.

We recently started to investigate the potential role of mood in unconscious thought. Mood might impact judgments and decisions based on unconscious thought in several ways. First, mood might impact the process of unconscious thought. We know from previous research that compared to a negative mood, a positive mood enhances associative processing and creativity (e.g., Bolte et al., 2003; Hänze & Hesse, 1993; Isen, 1987; Isen et al., 1987), which are characteristic of unconscious information processing (e.g., Dijksterhuis, 2007; Dijksterhuis & Nordgren, 2006; Sadler-Smith, 2008; Wilson, 2002). Therefore, elucidating the impact of mood

on the process of unconscious thought appears to be a fruitful direction for future research. Second, mood might impact the use of the products, or intuitions, that stem from unconscious thought. The exact nature of these intuitions is as yet unclear. For example, it is unknown to what extent these "summary judgments the unconscious provides when it is ready to decide" (Dijksterhuis & Nordgren, 2006, p. 106) are affective in nature. Therefore, whether the mood state of individuals also impacts the tendency to rely on intuitions stemming from unconscious thought is an interesting question that remains to be tested.

Finally, individuals might often profit from the use of intuition as well as deliberation, rather than using either intuition or deliberation in judgment and decision making. In fact, in our daily lives we often use a bit of both intuition and deliberation. Future research might be aimed at understanding how intuition and deliberation might interact and complement each other. For example, affect might help to prioritize information we need to analyze more carefully (e.g., Damasio, 1994; Peters, 2006). An interesting assumption is that wise decision makers blend affect and reason, intuition and deliberation.

Closing remarks

In the investigations presented in this dissertation, we have shown the impact of a ubiquitous factor in human decision making: a decision maker's mood state. We investigated the impact of mood states on a fundamental distinction in judgment and decision making, that is, the use of intuition versus deliberation. Our findings demonstrate that mood matters. A happy mood state appears to tune in to reliance on gut feelings and a sad mood state to analytical reasoning.

References

Arnold, M. (1870/2007). *St Paul and Protestantism.* Reprint Services Corp.

Arnold, M. B. (1960). *Emotions and personality* (2 Vols.). New York: Columbia University Press.

Avnet, T., & Higgins, E. T. (2003). Locomotion, assessment, and regulatory fit: Value transfer from "how" to "what". *Journal of Experimental Social Psychology, 39,* 525-530.

Avnet, T., & Higgins, E. T. (2006). How regulatory fit affects value in consumer choices and options. *Journal of Marketing Research, XLIII,* 1-10.

Bargh, J. A. (1997). The automaticity of everyday life. In S. R. Wyer (Ed.), *Advances in social cognition* (Vol. 10, pp. 1-61). Mahway, NJ: Lawrence Erlbaum Associates, Inc.

Baron, J. (2004). Normative models of judgment and decision making. In D. J. Koehler & N. Harvey (Eds.), *Blackwell Handbook of judgment and decision making* (pp. 19-36). Malden, USA: Blackwell Publishing.

Bechara, A. (2004). The role of emotion in decision-making: Evidence from neurological patients with orbitofrontal damage. *Brain and Cognition, 55,* 20-40.

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition, 50,* 7-15.

Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy. *Science, 275,* 1293-1295.

Bechara, A., Tranel, D., & Damasio, H. (2000). Characterization of the decision-making deficit of patients with ventromedial prefrontal cortex lesions. *Brain, 123,* 2189-2202.

Bechara, A., Tranel, D., Damasio, H., & Damasio, A. R. (1996). Failure to respond autonomically to anticipated future outcomes following damage to prefrontal cortex. *Cerebral Cortex, 6,* 215-225.

Betsch, C. (2004). Präferenz für Intuition und Deliberation. Inventar zur Erfassung von affekt- und kognitionsbasiertem Entscheiden. [Preference for intuition and deliberation (PID): An inventory for assessing affect- and cognition-based decision-making]. *Zeitschrift für Differentielle und Diagnostische Psychologie, 25,* 179-197.

Betsch, C. (2008). Chronic preferences for intuition and deliberation in decision making: Lessons learned about intuition from an individual differences approach. In H. Plessner, C. Betsch, & T. Betsch (Eds.), *Intuition in judgment and decision making* (pp. 231-248). New York: Lawrence Erlbaum Associates.

Betsch, C., & Kunz, J. J. (2008). The fit between preferred and applied decision-strategy as protective shield: effects of decisional fit. *Manuscript submitted for publication.*

Betsch, T., Hoffmann, K., Hoffrage, U., & Plessner, H. (2003). Intuition beyond recognition: When less familiar events are liked more. *Experimental Psychology, 50,* 49-54.

Betsch, T., Plessner, H., Schwieren, C., & Gütig, R. (2001). I like it but I don't know why: A value account approach to implicit attitude formation. *Personality and Social Psychology Bulletin, 27,* 242-253.

Bless, H. (2001). The relation between mood and the use of general knowledge structures. In L. L. Martin & G. L. Clore (Eds.), *Theories of mood and cognition: A user's guidebook* (pp. 9-26). Mahwah, NJ: Erlbaum.

Bless, H., Bohner, G., Schwarz, N., & Strack, F. (1990). Mood and persuasion: A cognitive response analysis. *Personality and Social Psychology Bulletin, 16,* 331-345.

Bless, H., Clore, G. L., Schwarz, N., Golisano, V., Rabe, C., & Wölk, M. (1996). Mood and the use of scripts: Does a happy mood really lead to mindlessness? *Journal of Personality and Social Psychology, 71,* 665-679.

Bless, H., & Schwarz, N. (1999). Sufficient and necessary conditions in dual-process models: The case of mood and information processing. In S. Chaiken & Y. Trope (Eds.). *Dual-process theories in social psychology* (pp. 423-440). New York: Guilford Press.

Bodenhausen, G. V., Kramer, G. P., & Süsser, K. (1994). Happiness and stereotypic thinking in social judgment. *Journal of Personality and Social Psychology, 66,* 621-632.

Böhm, G., & Brun, W. (2008). Intuition and affect in risk perception and decision making. *Judgment and Decision Making, 3,* 1-4.

Bolte, A., Goschke, T., & Kuhl, J. (2003). Emotion and intuition: Effects of positive and negative mood on implicit judgments of semantic coherence. *Psychological Science, 14,* 416-421.

Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research, 1968-1987. *Psychological Bulletin, 106,* 265-289.

Botvinick, M. M., Braver, T. S., Barch, D. M., Carter, C. S., & Cohen, J. D. (2001). Conflict monitoring and cognitive control. *Psychological Review, 108,* 624-652.

Botvinick, M. M., Cohen, J. D., & Carter, C. S. (2004). Conflict monitoring and anterior cingulated cortex: an update. *Trends in Cognitive Sciences, 8,* 539-546.

Bower, G. H. (1981). Mood and memory. *American Psychologist, 36,* 129-148.

Bruner, J. S. (1957). On perceptual readiness. *Psychological Review, 64,* 123-152.

Bush, G., Vogt, B. A., Holmes, J., Dales, A. M., Greve, D., Jenike, M. A., & Rosen, B. R. (2002). Dorsal anterior cingulate cortex: a role in reward-based decision making. *Proceedings of the National Academy of Sciences of the United States of America, 99,* 523-528.

Cacioppo, J. T., Petty, R. E., Losch, M. E., & Kim, H. S. (1986). Electromyographic activity over facia muscle regions can differentiate the valence and intensity of affective reactions. *Journal of Personality and Social Psychology, 50,* 260-268.

Chaiken, S., & Trope, Y. (1999). (Eds.) *Dual-process theories in social psychology.* New York: Guilford Press.

Clore, G. L., & Ortony, A. (2000). Cognitive neuroscience of emotion. In R. D. Lane, & L. Nadel (Eds.), *Cognitive neuroscience of emotion* (pp. 24-61). New York: Oxford University Press.

Clore, G. L., Schwarz, N., & Conway, M. (1994). Affective causes and consequences of social information processing. In R. S. Wyer, & T. K. Srull (Eds.), *Handbook of social cognition* (2nd ed.; Vol. 1, pp. 323-418). Hillsdale, NJ: Erlbaum.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112,* 155-159.

Cohen, J. D., & Blum, K. I. (2002). Reward and Decision. *Neuron, 36,* 193-198.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain.* London: Macmillan.

Darwin, C. (1872). *The expressions of the emotions in men and animals.* Chicago: University of Chicago Press (current edition 1965).

Davidson, R. J. (1992). Emotion and affective style: Hemispheric substrates. *Psychological Science, 3,* 39-43.

de Finetti, B. (1937). Foresight: Its logical laws, its subjective sources (trans. H. E. Kyburg, Jr. and H. E. Smokler). In H. E. Kyburg, Jr. and H. E. Smokler (Eds.), *Studies in subjective probability.* New York: Wiley, 1964.

De Vries, M., Holland, R. W., Chenier, T., Starr, M. J., & Winkielman, P. (2008). When you are happy, prototypes are just average: EMG and self-report evidence that positive mood eliminates preferences for highly familiar prototypes. *Manuscript in preparation.*

De Vries, M., Holland, R. W., Corneille, O., & Witteman, C. L. M. (2008). Simply sad: Mood state moderates rule-based decision making in investment and gambling games. *Manuscript submitted for publication.*

De Vries, M., Holland, R. W., & Witteman, C. L. M. (2008a). In the winning mood: Affect in the Iowa gambling task. *Judgment and Decision Making, 3,* 42-50.

De Vries, M., Holland, R. W., & Witteman, C. L. M. (2008b). Fitting decisions: Mood and intuitive versus deliberative decision strategies. *Cognition and Emotion, 22,* 931-943.

De Vries, M., Holland, R. W., & Witteman, C. L. M. (2008c). When both happy and sad individuals use intuition: On the availability of affective and analytical sources of information. *Unpublished data.*

De Vries, M., Holland, R. W., Witteman, C. L. M., Vente, F., & Dijksterhuis, A. (2008). Intuitive processes in diagnostic decision-making: Classification after conscious versus unconscious thought. *Manuscript in preparation.*

Deese, J. (1959). On the prediction of occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology, 58,* 17-22.

Denes-Raj, V., & Epstein, S. (1994). Conflict between intuitive and rational processing: When people behave against their judgment. *Journal of Personality and Social Psychology, 66,* 819-829.

Derryberry, D., & Tucker, D. M. (1994). Motivating the focus of attention. In P. M. Niedenthal & S. Kitayama (Eds.), *The heart's eye: Emotional influences in perception and attention* (pp. 167-196). New York: Academic Press.

Dienes, Z., & Scott, R. (2005). Measuring unconscious knowledge: Distinguishing structural knowledge and judgment knowledge. *Psychological Research, 69,* 338-351.

Dijksterhuis, A. (2004): Think different: The merits of unconscious thought in preference development in decision-making. *Journal of Personality and Social Psychology, 87,* 586-598.

Dijksterhuis, A. (2007). *Het slimme onbewuste: Denken met gevoel.* Amsterdam: Uitgeverij Bert Bakker.

Dijksterhuis, A., Bos, M. W., Nordgren, L. F., & Van Baaren, R. B. (2006). On making the right choice: The deliberation-without-attention effect. *Science, 311,* 1005-1007.

Dijksterhuis, A., & Nordgren, L. F. (2006). A theory of unconscious thought. *Perspectives on Psychological Science, 1,* 95-109.

Dunn, B. D., Dalgleish, T., & Lawrence, A. D. (2006). The somatic marker hypothesis: A critical evaluation. *Neuroscience and Biobehavioural Reviews, 30,* 239-271.

Ekman, P. (1989). The argument and evidence about universals in facial expressions of emotion. In H. Wagenr & A. Manstead (Eds.), *Handbook of social psychophysiology* (pp. 143-164). Chichester: Wiley.

Epstein, S. (1994). Integration of the cognitive and psychodynamic unconscious. *American Psychologist, 49,* 709-724.

Epstein, S., Pacini, R., Denes-Raj, V., & Heider, H. (1996). Individual differences in intuitive-experiental and analytical-rational thinking styles. *Journal of Personality and Social Psychology, 71,* 390-405.

Evans, C. Y., Bowman, C. H., & Turnbull, O. H. (2005). Subjective Awareness on the Iowa gambling task: The key role of emotional experience in schizophrenia.

Evans, J. St. B. T. (2008). Dual-Processing Accounts of Reasoning, Judgment, and Social Cognition. *The Annual Review of Psychology, 59: 6.1-6.24*. (First published online as a Review in Advance on May 31, 2007.)

Feldman Barrett, L., & Salovey, P. (2002). *The wisdom in feeling: Psychological processes in emotional intelligence*. New York: Guilford Press.

Ferguson, M. J., & Bargh J. A., (2004). Liking is for doing: The effects of goal pursuit on automatic evaluation. *Journal of Personality and Social Psychology, 87,* 557-572.

Fiedler, K. (1988). Emotional mood, cognitive style, and behaviour regulation. In K. Fiedler & J. Forgas (eds.), *Affect, cognition, and social behaviour* (pp.100-119). Toronto: Hogrefe International.

Finucane, M. L., Peters, E., & Slovic, P. (2003). Judgment and decision making: The dance of affect and reason. In S. L. Schneider & J. Shanteau (Eds.), *Emerging perspectives on judgment and decision research* (pp. 327-364). Cambridge: Cambridge University Press.

Fiske, S. T., & Neuberg, S. L. (1990). A continuum of impression formation from category-based to individuating processing: Influences of information and motivation on attention and interpretation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 23, pp. 1-74). Orlando, Fl: Academic Press.

Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin, 117,* 39-66.

Förster, J., Friedman, R. S., Özelsel, & Denzler, M. (2006). Enactment of approach and avoidance behavior influences the scope of perceptual and conceptual attention. *Journal of Experimental Social Psychology, 42,* 133-146.

Förster, J., Higgins, E. T. (2005). How global versus local perception fits regulatory focus. *Psychological Science, 16,* 631-636.

Freitas, A. L., Azizian, A., Travers, S., & Berry, S. A. (2005). The evaluative connotation of processing fluency: Inherently positive or moderated by motivational context? *Journal of Experimental Social Psychology, 41,* 636-644.

Freud, S. (1909). The analysis of a phobia in a five-year-old boy. In *Collected papers* London: Hogarth.

Freud, S. (1925). The unconscious. In *Collected papers* London: Hogarth.

Fridlund, A. J., & Cacioppo, J. T. (1986). Guidelines for human electromyographic research. *Psychophysiology, 23,* 567-589.

Friedman, R. S., & Förster, J. (2001). The effects of promotion and prevention cues on creativity. *Journal of Personality and Social Psychology, 81,* 1001-1013.

Frijda, N. H. (1986). *The emotions*. London, England: Cambridge University Press.

Frijda, N. H. (2007). *The laws of emotion.* Mahway, New Jersey: Laurence Erlbaum Associates.

Gasper, K., & Clore, G. L. (2002). Attending to the big picture: Mood and global versus local processing of visual information. *Psychological Science, 13,* 34-40.

Gazzaniga, M. S. (1972). One brain – two minds. *American Scientist, 60,* 311-317.

Gazzaniga, M. S., & LeDoux, J. E. (1978). *The integrated mind.* New York: Plenum.

Gigerenzer, G. (2007): *Gut feelings: The intelligence of the unconscious.* New York: Viking.

Gigerenzer, G. (2008). Why heuristics work. *Perspectives on Psychological Science, 3,* 20-29.

Gladwell, M. (2005). *Blink: The power of thinking without thinking.* New York: Little, Brown.

Haidt, J. (2001). The emotional dog and its rational tail: a social intuitionist approach to moral judgment. *Psychological Review, 108,* 814-834.

Halberstadt, J., & Rhodes, G. (2000). The attractiveness of nonface averages: Implications for an evolutionary explanation of the attractiveness of average faces. *Psychological Science, 11,* 285-289.

Halberstadt, J., & Rhodes, G. (2003). It's not just average faces that are attractive: Computer-manipulated averageness makes birds, fish, and automobiles attractive. *Psychonomic Bulletin & Review, 10,* 149-156.

Hamm, R. M. (1988). Clinical intuition and clinical analysis: Expertise and the cognitive continuum. In A. S. Elstein & J. Dowie (Eds.), *Professional judgment: A reader in clinical decision making* (pp. 78-105). New York: Cambridge University Press.

Hänze, M., & Hesse, F. W. (1993). Emotional influences on semantic priming. *Cognition and Emotion, 17,* 83-99.

Harlé, K. M., & Sanfey, A. G. (2007). Incidental sadness biases social economic decisions in the ultimatum game. *Emotion, 7,* 876-881.

Harmon-Jones, E. (2004). Contributions from research on anger and cognitive dissonance to understanding the motivational functions of asymmetrical frontal brain activity. *Biological Psychology, 67,* 51-76.

Harmon-Jones, E., & Allen, J. J. B. (2001). The role of affect in the mere exposure effect: Evidence from psychophysiological and individual differences approaches. *Personality and Social Psychology Bulletin, 27,* 889-898.

Harré, R. (1986). The social constructionist viewpoint. In R. Harré (Ed.), *The social construction of emotions* (pp. 2-14). Oxford: Blackwell.

Hassin, R. R., Uleman, J. S., & Bargh, J. A. (2005). *The new unconscious.* New York: Oxford University Press.

Hastie, R., & Dawes, R. M. (2001). *Rational choice in an uncertain World: The psychology of judgment and decision making.* Thousand Oaks, CA: Sage Publications.

Hermsen, B., Holland, R. W., & Van Knippenberg, A. (2008). Automatic caution: The influence of safety and danger signals on the automatic evaluation effect. *Manuscript submitted for publication.*

Higgins, E. T., Idson, L. C., Freitas, A. L., Spiegel, S., & Molden, D. C. (2003). Transfer of value from fit. *Journal of Personality and Social Psychology, 75,* 617-638.

Hogarth, R. M. (2001). *Educating intuition.* Chicago: Chicago University Press.

Hogarth, R. M. (2005). Deciding analytically or trusting your intuition? The advantages and disadvantages of analytic and intuitive thought. In T. Betsch & S. Haberstroh (Eds.), *The routines of decision-making* (pp. 67-82). Mahwah, NJ: Lawrence Erlbaum Associates.

Idson, L. C., Liberman, N., & Higgins, E. T. (2004). Distinguishing gains from non-losses and losses from non-gains: A regulatory focus perspective on hedonic intensity. *Journal of Experimental Social Psychology, 36,* 252-274.

Isen, A. M. (1987). Positive affect, cognitive processes, and social behavior. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 20, pp. 203-253). San Diego, CA: Academic Press.

Isen, A. M. (1999). Positive affect. In T. Dalgleish & M. Power (Eds.), *Handbook of cognition and emotion* (pp. 521-539). Sussex, UK: Wiley.

Isen, A. M. (2000). Positive affect and decision making. In M. Lewis & J. Haviland-Jones (Eds.), *Handbook of emotions* (2nd ed., pp. 417-435). New York: Guilford.

Isen, A. M., Daubman, K. A., & Nowicki, G. P. (1987). Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology, 52,* 1122-1131.

Isen, A. M., Johnson, M. M. S., Mertz, E., & Robinson, G. F. (1985). The influence of positive affect on the unusualness of word associations. *Journal of Personality and Social Psychology, 48,* 1413-1426.

Isen, A. M., & Means, B. (1983). The influence of positive affect on decision-making strategy. *Social Cognition, 2,* 18-31.

Isen, A. M., Means, B., Patrick, R., & Nowicki, G. (1982). Some factors influencing decision making strategy and risk taking. In M. S. Clark & S. T. Fiske (Eds.), *Affect and cognition* (pp. 243-261). Hillsdale, NJ: Erlbaum.

Jacobsen, E. (1957). Normal and pathological moods: Their nature and function. In R. S. Eisler, A. F. Freud, H. Hartman, & E. Kris (Eds.), *The psychoanalytic study of the child* (pp. 73-113). New York: International Universities Press.

James, W. (1884). What is an emotion? *Mind, 9,* 188-205.

James, W. (1890). *The principles of psychology, Part I.* Cambridge, MA: Harvard University press, 1981.

Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist, 28(9),* 697-720.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47,* 263-291.

Kerstholt, J. H., Van der Zwaard, F., Bart, H., & Cremers, A. (2008). Construction of health preferences: A comparison of direct assessment, text and video. *Manuscript submitted for publication.*

Klein, G. (2003). *Intuition at work: Why developing your gut instincts will make you better at what you do.* New York: Doubleday.

Koch, S., Holland, R. W., & Van Knippenberg, A. (in press). Lateralization of diffuse positive and negative affect: Ascribing valence to ambiguous stimuli. *Cognition and Emotion.*

Kuhl, J. (2000). A functional-design approach to motivation and self-regulation: The dynamics of personality systems interactions. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 105-134). San Diego: Academic Press.

Langlois, J. H., & Roggman, L. A. (1990). Attractive faces are only average. *Psychological Science, 1,* 115-121.

Lazarus, R. S. (1984). On the primacy of cognition. *American Psychologist, 39,* 124-129.

LeDoux, J. (1996). *The emotional brain: The mysterious underpinnings of emotional life.* New York: Simon and Schuster.

Lee, A. Y. (2001). The mere exposure effect: An uncertainty reduction explanation revisited. *Personality and Social Psychology Bulletin, 27,* 1255-1266.

Lerner, J. S., & Tiedens, L. Z. (2006). Portrait of the angry decision maker: How appraisal tendencies shape anger's influence on cognition. *Journal of behavioral decision making, 19,* 115-137.

Levine, R. S., Wyer, R. S., & Schwarz, N. (1994). Are you what you feel? The affective and cognitive determinants of self-judgments. *European Journal of Social Psychology, 24,* 63-77.

Lewis, M., & Haviland-Jones, J. M. (2000). *Handbook of emotions (2nd edition).* New York: Guilford Press.

Lieberman, M. D. (2000). Intuition: A social cognitive neuroscience approach. *Psychological Bulletin, 126,* 109-137.

Loewenstein, G. (1996). Out of control: Visceral influences on behaviour. *Organizational Behavior and Human Decision Processes, 65,* 272-292.

Loewenstein, G., & Lerner, J. S. (2003). The role of affect in decision making. In R. J. Davidson, K. R. Scherer & H. H. Goldsmith (Eds.), *Handbook of Affective Sciences* (pp. 619-642) Oxford University Press.

Mackie, D. M., & Worth, L. T. (1989). Processing deficits and the mediation of positive affect in persuasion. *Journal of Personality and Social Psychology, 57,* 27-40.

Mackie, D. M., & Worth, L. T. (1991). Feeling good, but not thinking straight: The impact of positive mood on persuasion. In J. P. Forgas (Ed.), *Emotion and social judgments* (pp. 201-219). Elmsford: Pergamon Press.

Maia, T. V., & McClelland, J. L. (2004). A re-examination of the evidence for the somatic marker hypothesis: What participants really know in the Iowa gambling task. *Proceedings of the National Academy of Sciences of the USA, 101,* 16075-16080.

Martin, L. L., & Clore, G. L. (Eds.). (2001). *Theories of mood and cognition: A user's guidebook.* Mahwah, NJ: Erlbaum.

Mitchell, R. L. C., & Phillips, L. H. (2007). The psychological, neurochemical and functional neuroanatomical mediators of the effects of positive and negative mood on executive functions. *Neuropsychologia, 45,* 617-629.

Moskowski, A. (1972). *Conversations with Einstein.* London: Sidgwick and Jackson.

Murphy, S. T., & Zajonc, R. B. (1993). Affect, cognition, and awareness: Affective priming with optimal and suboptimal stimulus exposures. *Journal of Personality and Social Psychology, 64,* 723-739.

Myers, D. G. (2002). *Intuition, its powers and perils.* New Haven, CT: Yale University Press.

Niedenthal, P. M., Krauth-Gruber, S., & Ric, F. (2006). *Psychology of emotion: Interpersonal, experiential, and cognitive approaches.* New York: Psychology Press.

Niedenthal, P. M., & Setterlund, M. (1994). Emotion congruence in perception. *Personality and Social Psychology Bulletin, 20,* 401-411.

Nørretranders, T. (1998). *The user illusion: Cutting consciousness down to size.* New York: Viking.

Nowlis, V., & Nowlis, H. H. (1956). The description and analysis of mood. *Annals of the New York Academy of Sciences, 65,* 345-355.

Oatley, K., & Jenkins, J. M. (1996). *Understanding emotions.* Malden, USA: Blackwell Publising.

Payne, J. W., Bettman, J. R., & Johnson, E. J. (1993). *The adaptive decision maker.* Cambridge: Cambridge University Press.

Peters, E. (2006). The functions of affect in the construction of preferences. In S. Lichtenstein & P. Slovic (Eds.), *The construction of preference.* New York: Cambridge University Press.

Peters, E., Lipkus, I., & Diefenbach, M. A. (2006). The functions of affect in health communications and in the construction of health preferences. *Journal of Communication, 56,* 140-162.

Peters, E., & Slovic, P. (2000). The springs of action: Affective and analytical information processing in choice. *Personality and Social Psychology Bulletin, 26,* 1465-1475.

Peters, E., Västfjäll, D., Gärling, T., & Slovic, P. (2006). Affect and decision making: A ”hot” topic. *Journal of Behavioral Decision Making, 19,* 79-85.

Pfister, H. R., & Böhm, G. (2008). The multiplicity of emotions: A framework of emotional functions in decision making. *Judgment and Decision Making, 3,* 5-17.

Plessner, H., Betsch, C., & Betsch, T. (2008). *Intuition in judgment and decision making.* New York: Lawrence Erlbaum Associates.

Plessner, H., & Czenna, S. (2008). The benefits of intuition. In H. Plessner, C. Betsch, & T. Betsch (Eds.), *Intuition in judgment and decision making* (pp. 251-266). New York: Lawrence Erlbaum Associates.

Posner, M. I., & Keele, S. W. (1968). On the genesis of abstract ideas. *Journal of Experimental Psychology, 77,* 353-363.

Price, M. C., & Norman, E. (2008). Intuitive decisions on the fringes of consciousness: Are they conscious and does it matter? *Judgment and Decision Making, 3,* 28-41.

Rhodes, G., Sumich, A., & Byatt, G. (1999). Are average facial configurations attractive only because of their symmetry? *Psychological Science, 10,* 52-58.

Roediger, H., & McDermott, K. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21,* 803-814.

Roediger, H., Watson, J., McDermott, K., & Gallo, D. (2001). Factors that determine false recall: A multiple regression analysis. *Psychonomic Bulletin & Review, 8,* 385-407.

Rosenthal, R., & Rosnow, R. L. (1985). *Content analyses: Forced comparisons in the analysis of variance.* Cambridge, England: Cambridge University Press.

Rotenberg, V. S. (2004). The peculiarity of the right-hemisphere function in depression: Solving the paradoxes. *Progress in Neuro-Psychopharmacology & Biological Psychiatry, 28,* 1-13.

Ruder, M., & Bless, H. (2003). Mood and the reliance on the ease of retrieval heuristic. *Journal of Personality and Social Psychology, 85,* 20-32.

Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review, 110,* 145-172.

Sadler-Smith, E. (2008). *Inside intuition.* London: Routledge

Satpute, A. B., & Lieberman, M. D. (2006). Integrating automatic and controlled processes into neurocognitive models of social cognition. *Brain Research, 1079,* 86-97.

Savage, L. J. (1954). *The Foundations of Statistics.* New York: Wiley.

Schachter, S., & Singer, J. (1962). Cognitive, social and physiological determinants of emotional state. *Psychological Review, 69,* 379-399.

Schwartz, B. (2004). *The paradox of choice: Why more is less.* New York: HarperCollins Publishers.

Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behaviour* (Vol. 2, pp. 527-561). New York: Guilford Press.

Schwarz, N. (2000). Emotion, cognition and decision making. *Cognition and Emotion, 14,* 433-440.

Schwarz, N. (2002). Situated cognition and the wisdom in feelings: Cognitive tuning. In L. Feldman Barrett & P. Salovey (Eds.), *The wisdom in feeling: Psychological processes in emotional intelligence* (pp. 144-166). New York: Guilford Press.

Schwarz, N. (2006). Feelings, Fit, and Funny Effects: A Situated Cognition Perspective. *Journal of Marketing Research, XLIII,* 20-23.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology, 45,* 513-523.

Schwarz, N., & Clore, G. L. (1988). How do I feel about it? Informative functions of affective states. In K. Fiedler & J. Forgas (Eds.), *Affect, cognition and social behaviour* (pp. 44-62). Toronto, Ontario, Canada: Hogrefe International.

Schwarz, N., & Clore, G. L. (2007). Feelings and phenomenal experiences. In E. T. Higgins & A. Kruglanski (Eds.), *Social Psychology: Handbook of basic principles* (2nd ed.; pp. 385-407) New York: Guilford Press.

Seibert, P. S., & Ellis, H. C. (1991). Irrelevant thoughts, emotional mood states, and cognitive task performance. *Memory and Cognition, 19,* 507-513.

Shiv, B., Loewenstein, G., Bechara, A., Damasio, H., & Damasio, A. R. (2005). Investment behaviour and the negative side of emotion. *Psychological Science, 16,* 435-439.

Simon, H. A. (1955). A behavioral model of rational choice. *Quarterly Journal of Economics, 69,* 99-118.

Simon, H. A. (1957). *Models of man: Social and rational.* New York: Wiley.

Simon, H. A. (1983). *Reason in human affairs.* Stanford, CA: Stanford University Press.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin, 119,* 3-22.

Storbeck, J., & Clore, G. L. (2005). With sadness comes accuracy; with happiness false memory: Mood and the false memory effect. *Psychological Science, 16,* 785-791.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review, 8,* 220-247.

Strick, M., Holland, R.W., & Van Knippenberg, A. (in press). Seductive eyes: attractiveness and direct gaze increase desire for associated objects. *Cognition*.

Symons, D. (1979). *Evolution of human sexuality.* New York: Oxford University Press.

Tetlock, P. E. (2002). Social functionalist frameworks for judgment and choice: Intuitive politicians, theologians, and prosecutors. *Psychological Review, 109,* 451-471.

Thornhill, R., & Gangestad, S. W. (1993). Human facial beauty: Averageness, symmetry and parasite resistance. *Human Nature, 4,* 237-269.

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5,* 207-232.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: heuristics and biases. *Science, 185,* 1124-1131.

Vermeulen, N., Corneille, O., & Luminet, O. (2007). A mood moderation of the Extrinsic Affective Simon Task. *European Journal of Personality, 21,* 359-369.

Vermeulen, N., Luminet, O., & Corneille, O. (2006). Alexithymia and the Automatic Processing of Affective Information. *Cognition and Emotion, 20,* 64-91.

Von Neumann, J., & Morgenstern, O. (1947). *Theories of games and economic behavior.* Princeton, NJ: Princeton University Press.

Wagar, B. M., & Dixon, M. (2006). Affective guidance in the Iowa gambling task. *Cognitive, Affective, & Behavioural Neuroscience, 6,* 277-290.

Wegener, D. T., & Petty, R. E. (1994). Mood-management across affective states: The hedonic contingency hypothesis. *Journal of Personality and Social Psychology, 66,* 1034-1048.

Wegener, D. T., Petty, R. E., & Smith, S. M. (1995). Positive mood can increase or decrease message scrutiny: The hedonic contingency view of mood and message processing. *Journal of Personality and Social Psychology, 69,* 5-15.

Whittlesea, B. W. A. (2002). False memory and the discrepancy-attribution hypothesis: The prototype-familiarity illusion. *Journal of Experimental Psychology: General, 131,* 96-115.

Whittlesea, B. W. A., & Price, J. R. (2001). Implicit/Explicit memory versus analytic/nonanalytic processing: Re-thinking the mere exposure effect. *Memory & Cognition, 29,* 234-246.

Wilson, T. D. (2002). *Strangers to ourselves: Discovering the adaptive unconscious.* Cambridge, MA: Harvard University Press.

Wilson, T. D., Lisle, D., Schooler, J. W., Hodges, S. D., Klaaren, K. J., & LaFleur, S. J. (1993). Introspecting about reasons can reduce post-choice satisfaction. *Personality and Social Psychology Bulletin, 19,* 331-339.

Wilson, T. D., & Schooler, J. W. (1991). Thinking too much: Introspection can reduce the quality of preferences and decisions. *Journal of Personality and Social Psychology, 60,* 181-192.

Winkielman, P., & Cacioppo, J. T. (2001). Mind at ease puts a smile on the face: Psychophysiological evidence that processing facilitation leads to positive affect. *Journal of Personality and Social Psychology, 81,* 989-1000.

Winkielman, P., Halberstadt, J., Fazendeiro, T., & Cutty, S. (2006). Prototypes are attractive because they are easy on the mind. *Psychological Science, 17,* 799-806.

Winkielman, P., Knutson, B., Paulus, M., & Trujillo, J. L. (2007). Affective influences on judgments and decisions: Moving towards core mechanisms. *Review of General Psychology, 11,* 179-192.

Winkielman, P., Schwarz, N., Fazendeiro, T., & Reber, R. (2003). The hedonic marking of processing fluency: Implications for evaluative judgment. In J. Musch & K. C. Klauer (Eds.), *The psychology of evaluation: Affective processes in cognition and emotion* (pp. 189-217). Mahwah, NJ: Erlbaum.

Woolf, V. (1965). *Jacob's room.* Harmondsworth: Penguin.

Wundt, W. (1907). *Outlines of psychology*. Leipzig, Germany: Wilhelm Engelmann.

Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology, 9,* 1-27.

Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist, 35,* 151-175.

Zajonc, R. B. (1984). On the primacy of affect. *American Psychologist, 39,* 117-123.

Zajonc, R. B. (2001). Mere exposure: A gateway to the subliminal. *Current Directions in Psychological Science, 10,* 224-228.

Zeelenberg, M., Nelissen, R. M. A., Breugelmans, S. M., & Pieters, R. (2008). On emotion specificity in decision making: Why feeling is for doing. *Judgment and Decision Making, 3,*18-27.

Summary of Results

Mood Matters in Judgment and Decision Making

Tuning in to Deliberation and Intuition

Mood states influence the reliance on gut feelings (intuition) versus analytical reasoning (deliberation) in judgment and decision making.

- Compared to a sad mood state, a happy mood state causes a stronger inclination in decision makers to rely on intuition (Chapters 2 and 4).
- Compared to a happy mood state, a sad mood state causes a stronger inclination in decision makers to rely on deliberation (Chapters 3 and 4).

Fitting decisions enhance the subjective value of a decision-outcome.

- Individuals in a happy mood state value a decision-outcome more after making an intuitive decision and individuals in a sad mood state value a decision-outcome more after making a deliberative decision (Chapter 4).
- Individuals with a dispositional preference for intuitive decision making value a decision-outcome more after making an affect-based decision and individuals with a dispositional preference for deliberative decision making value a decision-outcome more after making a decision based on a careful analysis of the pros and cons (Chapter 4).

Mood changes the hedonic implications of the familiarity cue of prototypes.

- Compared to a sad mood state, a happy mood state decreases the positive hedonic value (self-reported and measured by EMG) of prototypes (Chapter 5).
- Compared to a sad mood state, a happy mood state does not decrease the familiarity of prototypes (Chapter 5).

Samenvatting

(Summary in Dutch)

Oordelen en Beslissen met Gevoel

Afstemmen op Deliberatie en Intuïtie

Het maken van keuzes is een belangrijk onderdeel van ons leven. Dag in dag uit vormen we oordelen en nemen we beslissingen. Zo besluiten we bijvoorbeeld om psychologie te gaan studeren, een huis in Nijmegen te kopen of om op vakantie te gaan in Spanje. Ook nemen we voortdurend meer alledaagse beslissingen. We beslissen welke producten we kopen in de supermarkt, nemen een abonnement op onze favoriete ochtendkrant en bestellen ons lievelingsdrankje op het terras als de zon schijnt. Velen van ons nemen ook beroepsmatig belangrijke beslissingen. Rechters beslissen bijvoorbeeld over de toekomst van een verdachte, hulpverleners stellen diagnoses en investeerders nemen belangrijke financiële beslissingen. Oordelen en beslissen doen we op verschillende manieren. We kunnen diep nadenken ofwel delibereren voordat we beslissen, maar we kunnen ook ons gevoel volgen, intuïtief beslissen. Dit proefschrift gaat over de invloed van stemming op ons vertrouwen in intuïtie en deliberatie bij oordelen en beslissen.

In eerder onderzoek naar de rol van stemming bij oordelen en beslissen is vrijwel geen aandacht geschonken aan de invloed van stemming op het afgaan op gevoelens en overwegingen, ofwel intuïtie en deliberatie, bij het nemen van beslissingen. Of we afgaan op ons gevoel of op ons verstand, kan echter van grote invloed zijn op onze oordelen en beslissingen. Onze gevoelens en overwegingen wijzen immers niet altijd in dezelfde richting. Wanneer ik bijvoorbeeld trek heb in een tussendoortje, kan mijn gevoel me verleiden tot het eten van een chocoladereep, maar op basis van mijn verstand zou ik eerder kiezen voor een appel. Het doel van dit proefschrift is meer inzicht te krijgen in het effect van stemming op het gebruik van intuïtie en deliberatie bij oordelen en beslissen. Hierbij staan de volgende twee vragen centraal: *Wat* is het effect van een vrolijke versus een verdrietige stemming op het afgaan op intuïtie versus deliberatie en *hoe* werkt dit?

In hoofdstuk 1 van dit proefschrift geef ik een overzicht van relevante theorieën en empirische studies over de rol van stemming bij intuïtief en doordacht oordelen en beslissen. Ik maak in de eerste plaats onderscheid tussen verschillende vormen van affect: affectieve toestanden ofwel stemming aan de ene kant en affectieve reacties zoals intuïties aan de andere

kant. In overeenstemming met gangbare definities binnen de psychologie vatten wij stemming op als diffuse affectieve toestanden ofwel achtergrondgevoelens die relatief lang aanhouden. Je bent *in* een vrolijke of verdrietige stemming, gedurende enkele minuten of zelfs uren. Affectieve reacties echter, zijn gevoelens die we hebben *als reactie op* een object, persoon, situatie of keuzemogelijkheid. Deze vorm van affect omvat intuïties ten aanzien van keuzemogelijkheden en is gewoonlijk intenser en van kortere duur dan stemming. De bovengenoemde vormen van affect kunnen op verschillende manieren onze oordelen en beslissingen beïnvloeden. Dit proefschrift beschrijft de eerste empirische studies naar de invloed van vrolijke en verdrietige affectieve toestanden op het afgaan op affectieve reacties versus analytisch redeneren bij oordelen en beslissen. In welke stemming zijn mensen meer geneigd om op hun gevoelens af te gaan, in een vrolijke of in een verdrietige stemming? In welke stemming zijn mensen juist meer geneigd om doordachte beslissingen te nemen?

In hoofdstuk 1 bespreek ik ook het prominente onderscheid binnen de besliskunde tussen intuïtie en deliberatie. Daarnaast geef ik een overzicht van de verschillende manieren waarop affect een rol kan spelen bij oordelen en beslissingen. Hierbij contrasteer ik moderne opvattingen over de rol van affect en intuïtie bij oordelen en beslissen met klassieke, normatieve modellen binnen de besliskunde. Binnen deze klassieke modellen was de gangbare opvatting dat het vormen van oordelen en het nemen van beslissingen puur rationele en doordachte aangelegenheden zijn. Tegenwoordig hebben veel onderzoekers aandacht voor het mogelijke belang van affect en intuïtie bij oordelen en beslissen.

Hierna ga ik in op de door ons veronderstelde afstemming op intuïtie en deliberatie door de opgewekte of sombere affectieve toestand, ofwel stemming, van beslissers. Ons idee is dat stemming mensen voorbereidt om intuïtief dan wel doordacht te oordelen en beslissen. Hieraan ligt de meer algemene veronderstelling ten grondslag dat we ons denken, voelen en handelen automatisch afstemmen op de aard van de omgeving waarin we onze doelen proberen te bereiken. Verschillende factoren, onder andere onze stemming, dienen mogelijk als een signaal voor de aard van onze omgeving. In een goedaardige omgeving, waar alles op rolletjes loopt, is het gewoonlijk niet nodig om alles voorzichtig en grondig te overdenken. Individuen kunnen dan op hun eerste ingevingen, op hun intuïtie, vertrouwen. Als er echter potentieel gevaar dreigt of de omgeving problematisch lijkt, maar de precieze aard van de problemen onduidelijk is, is het belangrijk om voorzichtiger te zijn en alle potentieel relevante aspecten van de omgeving goed te

analyseren. Volgens het afstemmingsmodel werkt stemming als een geconditioneerd signaal voor de goedaardige of problematische aard van onze omgeving.

We hebben de rol van stemming bij oordelen en beslissen in vier empirische hoofdstukken beschreven (hoofdstukken 2, 3, 4 en 5). Onze verwachting was dat een vrolijke, opgewekte stemming zou leiden tot de neiging om intuïtief te beslissen en dat een verdrietige, sombere stemming zou leiden tot de neiging om doordacht en analytisch beslissingen te nemen. De studies die we in deze hoofdstukken beschreven hebben, volgden een algemeen stramien: Het eerste gedeelte van iedere studie bestond uit een manipulatie (de meeste studies) of een meting van stemming. We maakten gebruik van verschillende stemmingsmanipulaties, waaronder het vertonen van een vrolijk of verdrietig filmfragment. Het tweede gedeelte van onze studies omvatte vervolgens een meting van oordelen en beslissingen gemaakt door deelnemers in een vrolijke of verdrietige stemming. Hierbij maakten we gebruik van zowel bestaande als nieuw ontworpen paradigma's.

In hoofdstuk 2 hebben we in drie studies de rol van stemming bij het afgaan op affectieve signalen bij het nemen van beslissingen onderzocht. Hiervoor speelden deelnemers na een stemmingsmeting of stemmingsmanipulatie de Iowa goktaak, een veel gebruikte taak voor het meten van intuïtieve beslissingen in een laboratorium. In deze goktaak leren deelnemers al doende bij welke van vier stapels kaarten ze gemiddeld geld winnen en bij welke ze gemiddeld geld verliezen. Belangrijk is dat hierbij verschillende fasen zijn te onderscheiden, waaronder een intuïtieve fase, waarin deelnemers wel het gevoel hebben dat sommige stapels beter zijn dan andere, maar nog niet precies kunnen uitleggen waar dit gevoel vandaan komt. Volgens verwachting vonden we in alle drie de studies dat deelnemers in een opgewekte stemming betere keuzes maakten in deze intuïtieve fase van de Iowa goktaak dan deelnemers in een bedroefde stemming. Deze bevindingen bieden empirische ondersteuning voor het idee dat een vrolijke stemming leidt tot een sterkere neiging om beslissingen te baseren op affectieve reacties dan een verdrietige stemming.

Het complement van onze verwachting over de rol van stemming bij intuïtief en deliberatief beslissen hebben we in hoofdstuk 3 beschreven. We hebben hier in twee studies het effect van een vrolijke of verdrietige stemming op deliberatief beslissen onderzocht. Wederom speelden deelnemers een gokspel nadat we hun stemming gemanipuleerd hadden. Ditmaal onderzochten we de mate waarin deelnemers in een vrolijke of verdrietige stemming vasthielden

aan een logische regel bij het nemen van beslissingen. We maakten hierbij onder andere gebruik van de door ons ontworpen Radboud University Logic versus Experience (RULE) taak. Opnieuw waren de resultaten in overeenstemming met onze verwachting: Deelnemers in een sombere stemming hielden meer vast aan een logische regel dan deelnemers in een vrolijke stemming. Deze bevindingen vormen empirische ondersteuning voor het idee dat een sombere stemming leidt tot een sterkere neiging om deliberatief te beslissen dan een opgewekte stemming.

In hoofdstuk 4 bouwden we vervolgens voort op en vonden we aanvullend bewijs voor ons idee dat een vrolijke stemming leidt tot de neiging om op intuïtie af te gaan en dat een verdrietige stemming leidt tot de neiging om op analytische redeneringen af te gaan. We onderzochten het mogelijke effect van het al dan niet bij elkaar passen van een vrolijke of verdrietige stemming aan de ene kant en een intuïtieve of deliberatieve beslisstrategie aan de andere kant op de mate waarin beslissers de uitkomst van hun beslissing positief waarderen. Zoals verwacht was bij een goede klik tussen stemming en beslisstrategie (vrolijk en intuïtief; verdrietig en doordacht) de subjectieve waarde van een beslisuitkomst hoger dan wanneer stemming en beslisstrategie niet goed bij elkaar pasten. We vonden een vergelijkbaar effect voor de klik tussen persoonlijke voorkeuren voor intuïtief en deliberatief beslissen en de gebruikte beslisstrategie. Het gevonden effect van de klik tussen stemming en intuïtief of doordacht beslissen biedt ook ondersteuning voor het door ons veronderstelde afstemmingsmodel.

Het veronderstelde afstemmingsmodel hebben we in hoofdstuk 5 verder onderzocht door te kijken naar de invloed van affectieve toestanden op de neiging om een voorkeur te hebben voor gemiddelde, prototypische stimuli. Prototypische stimuli vertonen de meeste overeenkomsten met ieder individueel exemplaar uit een categorie en komen mensen daarom over het algemeen vertrouwd en bekend voor. Nadat je als het ware enkele “kinderen” gezien hebt, komt de “ouder” die je nooit eerder gezien hebt je toch erg bekend voor. Redenerend vanuit het afstemmingsmodel hangt de mate waarin mensen deze vertrouwdheid als positief ervaren mogelijk af van hun stemming. Een verdrietige stemming signaleert volgens dit model een problematische en mogelijk gevaarlijke omgeving. Hierdoor was onze verwachting dat prototypische stimuli aantrekkelijker zouden zijn voor mensen in een verdrietige stemming dan voor mensen in een vrolijke stemming. Dit bleek inderdaad zo te zijn. Bovendien bleek de mate waarin deze stimuli bekend voorkomen niet minder te zijn in een vrolijke dan in een verdrietige

stemming. Affectieve toestanden lijken dus, zoals verwacht, reacties af te stemmen op de aard van de omgeving die ze signaleren.

Tot slot bestaat hoofdstuk 6 uit een samenvattend overzicht van de belangrijkste bevindingen van dit proefschrift, gevolgd door een bespreking van de theoretische en praktische implicaties van deze empirische bevindingen en suggesties voor vervolgonderzoek. Zo wijzen de bevindingen uit dit proefschrift op het belang van het onderscheid in tenminste twee typen regels: vuistregels ofwel heuristieken aan de ene kant en logische regels aan de andere kant. In een vrolijke stemming gaan we meer af op vuistregels en in een verdrietige stemming gaan we juist meer af op logische regels. Verder zou een opgewekte stemming ons in het dagelijks leven kunnen helpen bij het maken van de overweldigende hoeveelheid keuzes. Het lijkt rationeel om met de beperkte tijd en energie die we hebben, te kiezen voor opties die “goed genoeg”, maar niet noodzakelijk “de beste” zijn. Een vrolijke affectieve toestand helpt ons hier mogelijk bij door af te stemmen op intuïtie.

Kortom, de in dit proefschrift beschreven studies tonen de invloed van een alomtegenwoordige factor bij oordelen en beslissen: de stemming van de beslisser. Onze studies bieden bewijs voor het idee dat mensen in een vrolijke stemming geneigd zijn om intuïtief te beslissen en dat mensen in een verdrietige stemming geneigd zijn om deliberatief te beslissen. De vrolijke of verdrietige affectieve toestand waarin iemand verkeert, lijkt af te stemmen op het gebruik van gevoelens tegenover analytische overwegingen.

Dankwoord

(*Acknowledgements*)

Verschillende mensen zijn de afgelopen jaren betrokken geweest bij voor mij belangrijke beslissingen, waaronder het besluit om mij aan te stellen als promovenda in Nijmegen. Rob en Cilia, bedankt dat jullie mij de kans gaven om dit proefschrift te schrijven! Cilia, bedankt ook dat je me introduceerde in de internationale besliskundige gemeenschap. Verder mijn dank voor je uitgebreide en zinvolle feedback op teksten voor zowel dit proefschrift als voor de wetenschappelijke artikelen die we samen schreven de afgelopen jaren. Dat er nog maar een paar mooie gemeenschappelijke publicaties mogen volgen! Rob, ik kan me geen betere dagelijks begeleider voorstellen. Dank voor al je enthousiasme, vertrouwen en optimisme! Besprekingen met jou gaven me altijd een goed gevoel en vaak ontstonden er mooie nieuwe ideeën voor verder onderzoek. Bedankt dat je me ook na het afronden van mijn proefschrift de mogelijkheid bood om bij jou verder te gaan in het onderzoek. Ik zie uit naar nog vele inspirerende besprekingen en mooie nieuwe studies met jou de komende tijd!

Mijn collega's van de afdeling Medische Besliskunde in Leiden dank ik voor hun besluit om mij als nieuwe collega aan te nemen en voor de hartelijke ontvangst op de afdeling! Ik vind het erg leuk om met jullie samen te gaan werken. Jan, Rinie en Jochem, dank voor de heerlijke slaapplek in de duinen toen ik aan mijn nieuwe baan in Leiden begon. Anne, Cees, Lotte en Nienke, bedankt dat ik vervolgens de zomer door mocht brengen in jullie huis in Oegstgeest, samen met Bram de kat. Eva, bedankt voor je hulp in Leiden en wat fijn dat we elkaar nu gewoon even op de fiets kunnen opzoeken! Graag wil ik hier ook de mensen bedanken die de afgelopen tijd met mij mee hebben gedacht over mijn toekomst, in het bijzonder: Cees en Eva Midden, Jacob, José, Nicole, Rob en Thea.

Mijn dank ook aan mijn Nijmeegse collega's van met name de afdelingen Gezin en Gedrag, Klinische Psychologie en Sociale en Cultuur Psychologie, voor overleg, samenwerking en gezelligheid. Monique Zegers, met wie ik niet alleen een kamer, maar ook verjaardagsdatum bleek te delen en Mieke, bedankt voor de fijne tijd, jullie waren geweldige kamergenotes! Monique van de Ven, dank voor al je proefschrift- en promotietips. Graag wil ik ook mensen bedanken die mij op allerlei manieren hebben geholpen met mijn onderzoek. Hedwig, Katja, Lanneke, Marijke en Thea, heel hartelijk bedankt voor alle ondersteuning! Veel van mijn scriptiestudenten hielpen mee met lopend onderzoek voor mijn proefschrift. Ook anderen hielpen bij de opzet, afname en dataverwerking van verschillende studies, waaronder Hilde, Ron, Stijn, Eva, Maarten, Pam, Ronny, Bjorn, André, Harrie, Jos, Gerard en natuurlijk alle studenten die deelnamen aan de in dit proefschrift beschreven studies. Bedankt allemaal!

Collega's van de diagnostische besluitvormingsgroep, dank voor het uitwisselen van ideeën tijdens de besprekingen. Daarnaast speciale dank aan John, voor de fantastische data-analytische hulp, aan José voor de inspirerende gesprekken en samenwerking en aan Leontien voor extra meelezen en voor het zijn van een fijne medepromovenda in de groep al die jaren. Collega's van de afdeling Sociale en Cultuur Psychologie, bedankt dat ik altijd mocht aanschuiven voor inspirerende besprekingen en praatjes en bedankt ook voor de vele gezellige sociale gelegenheden. Madelijn, bedankt voor onze memorabele trips door de USA, door California en door de Deep South, als vertegenwoordigers van het Blues Science Institute (BSI)! Ischa, ik vond het heel bijzonder om samen met jou de laatste fase van het schrijven van een proefschrift door te gaan. Bedankt voor de fijne en productieve schrijfdagen en voor de lekkere meergranen croissantjes van de bakker! Ischa en Severine, geweldig dat jullie mijn paranimfen wilden zijn! Dank voor al het meedenken en voor al jullie hulp de afgelopen tijd. Het voelt goed om jullie aan mijn zijde te hebben. Verder mijn dank aan collega's uit de rest van het land voor de goede samenwerking en leuke contacten.

I would also like to thank my colleagues and friends from abroad. Piotr, thank you for giving me the opportunity to visit you at the University of San Diego in California. It is great to work with you! Moreover, thank you for all the interesting and fun activities and experiences, such as your excellent sightseeing tour of Warsaw, having authentic Mexican fish tacos, lots of spicy Thai food, sushi and even raw, and surprisingly delicious, food in Hillcrest. Thomas, thanks for all your hospitality! Piotr, Troy, Mark, Thomas, Sabine, Minna, Kate, Claire, Hilda, Dave, Don, Andy, Stuart and others from the Psychology Department at UCSD, thanks to all of you for the wonderful time in San Diego! I would also like to thank Olivier for the great collaboration and Sascha for great email discussions on mood and affect.

Graag wil ik ook mijn vrienden en vriendinnen bedanken. Als dit boekje uitkomt, ken ik veel van mijn Nijmeegse vrienden precies tien jaar. Nienke, Wiede, Stijn en Eva, bedankt voor jullie vriendschap al die jaren! Jeanine, Richard, Theo, Ine, Dorine, Vincent, Joost, Martin, Martin, Tineke, Anke, Wout en anderen met wie ik jarenlang beneden aan de Berg en Dalseweg woonde, bedankt voor de mooie tijden en vriendschappen, ook na de Gildehuistijd! Ook andere vrienden en vriendinnen wil ik hier graag bedanken, in het bijzonder Eva, Marjolein, Annemarie en de Indiagangers Michiel, Sofie, Jasper, Anouk, Frans, Bert en Mieke. Mieke, ik vind het echt geweldig dat je dit boekje zo mooi wilde illustreren! Dank ook voor je verdere ondersteuning in de voorbereidingen van mijn promotie.

Mijn ouders, Marilène en Jos, dank jullie wel voor alle interesse, steun, liefde en vertrouwen die jullie mij de afgelopen jaren en daarvoor altijd hebben gegeven. Bedankt voor de stevige basis én de vrijheid om te doen wat ik wilde, ik heb altijd op jullie kunnen bouwen en vertrouwen! Wieteke, mijn lieve zusje, en Roel, jullie ook heel erg bedankt voor alle interesse en steun. Dank ook aan de rest van mijn familie, in het bijzonder aan oma en tante Grada. Jacques en Francien, Andrea, Guus en Luuk, Bram, Emmy en Anna, jullie wil ik ook heel erg bedanken voor de steun die jullie me altijd gegeven hebben en de belangstelling die jullie altijd getoond hebben. Jacques en Francien, jullie zijn fantastische schoonouders. We kunnen alles samen delen en dat voelt heel bijzonder. Andrea, Guus en Luuk, bedankt ook voor al jullie gastvrijheid op de boerderij.

Tot slot, de voor mij meest dierbare beslissing vindt zijn oorsprong in Varanasi, India. Wat een ontmoeting, tijdens de millenniumwisseling, daar aan de oevers van de Ganges! We besloten elkaar nog eens te ontmoeten, in Bombay, in Bangkok, op Schiphol, in Middenmeer, Nuenen en Nijmegen. Jij kwam naar Arnhem, later kozen we samen voor een fantastisch huisje bij het bos aan de Berg en Dalseweg in Nijmegen. We kozen ook samen voor Ecuador, Frankrijk en Spanje. Voor India en Indonesië. Voor Jordanië, Tanzania en Ierland. Voor Salsa en San Diego. Voor Bryce, Zion en de Grand Canyon. Voor elkaar, vooral voor elkaar. Jacob, mijn meest intense en gelukkigste gevoel betreft jou. Dank voor al je steun, vertrouwen en liefde. Ik hou van je!

Curriculum Vitae

Curriculum Vitae

Marieke de Vries was born in Eindhoven, the Netherlands, on March 3, 1980. She grew up in Nuenen and after finishing secondary education (Gymnasium) at the Eckart College in Eindhoven in 1998, she moved to Nijmegen to study Psychology at the Radboud University Nijmegen. In 1999, she went to Varanasi to volunteer in the slums of this Northern-Indian city for half a year. From 2000 onwards, she continued her studies in Psychology in Nijmegen, took part in the Honours Program of the Radboud University Nijmegen and obtained her Master's degree in Social Psychology (cum laude) in 2003. She went back to India for three months and from 2004 to 2008 she worked as a junior researcher and teacher at the Behavioural Science Institute (Radboud University) in Nijmegen and wrote this dissertation. She obtained travel grants from the European Association of Experimental Social Psychology (EAESP), the Faculty of Social Sciences (Radboud University Nijmegen) and Radboud University Nijmegen for two research visits (in 2007 and 2008) to the University of California in San Diego, United States of America, to work together with Prof. dr. Piotr Winkielman. She currently works as a researcher at the Radboud University Nijmegen in collaboration with dr. Rob Holland. Moreover, in May 2008, she started as a senior researcher in psychology of judgment and decision making at the Department of Medical Decision Making of the University Medical Center in Leiden, the Netherlands.